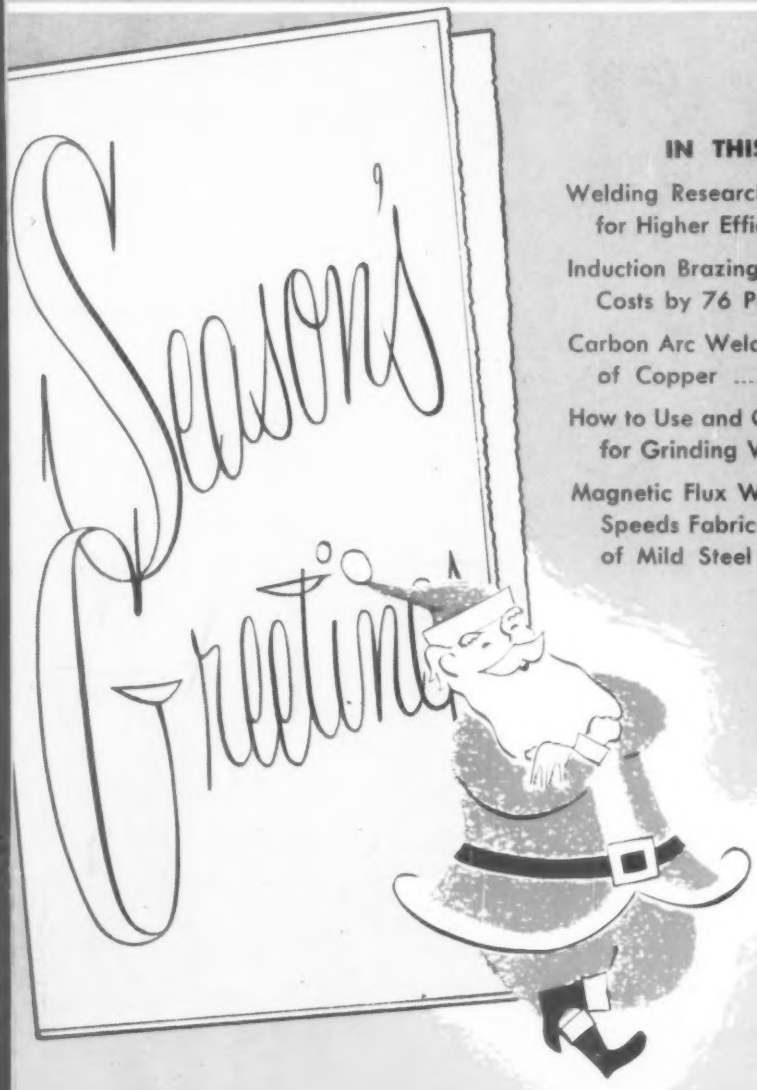
DECEMBER, 1954

Industry & Welding



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FRANCHISE CIRCULATION

Jackson SAFETY HATS and CAPS — Cap-and-Helmet Combinations

For protection against falling objects and other sudden impact, and against bumping the head in close quarters, the new Jackson Safety Hats are a *safe* and *sound* investment.

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Plastic Headband allows immediate, positive adjustment, is clearly marked in hat sizes, holds its shape, and gives firm fit on all sizes of heads. Straps of webbing button to inside of hat shell, and provide adjustable support on top of the head. They provide the required safe distance between top of head and hat shell and leave ample room for ventilation all around.

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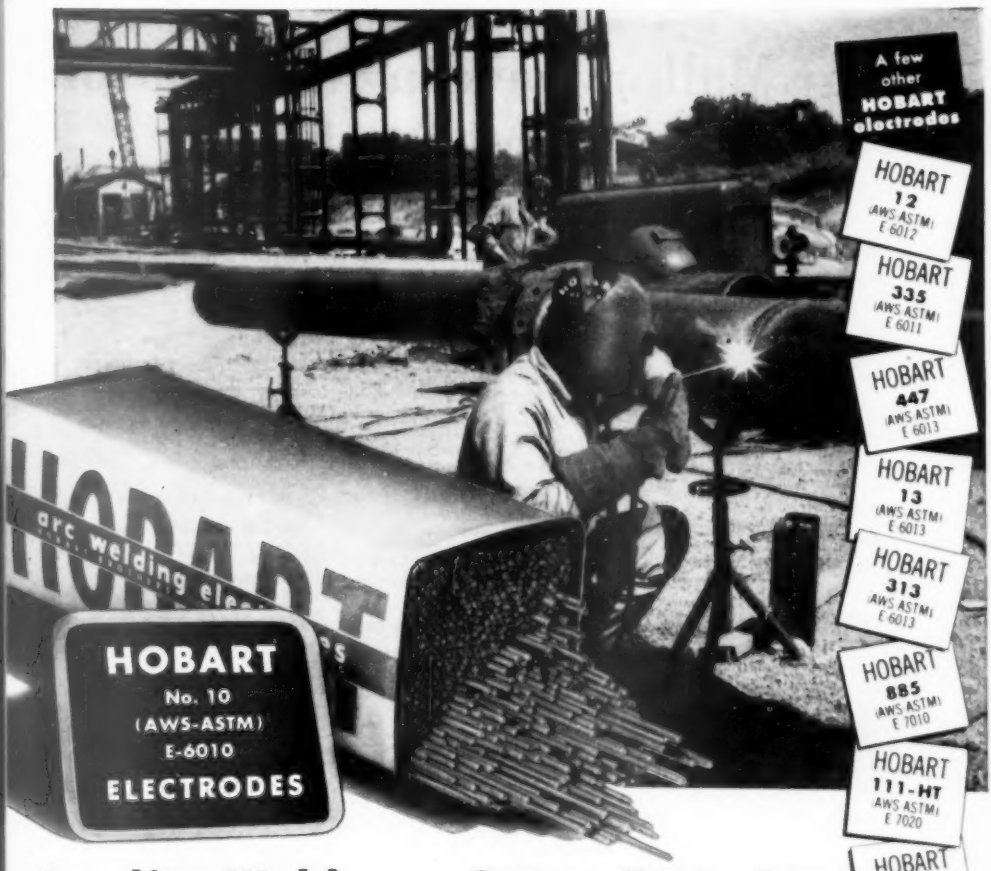

A few other **HOBART** electrodes

- **HOBART 12** (AWS ASTM) E 6012
- **HOBART 335** (AWS ASTM) E 6011
- **HOBART 447** (AWS ASTM) E 6013
- **HOBART 13** (AWS ASTM) E 6013
- **HOBART 313** (AWS ASTM) E 6013
- **HOBART 885** (AWS ASTM) E 7010
- **HOBART 111-HT** (AWS ASTM) E 7020
- **HOBART ROCKET 24** (AWS ASTM) E 6024
- **HOBART 16 & 716** (AWS ASTM) E 7016
- **HOBART 816** (AWS ASTM) E 8016

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Widely employed in the welding of high pressure mild steel piping, pipe lines, structural steel work, oil well casing, boilers, storage tanks, and ship construction. It is especially made for welding on material where tie-up stresses are involved. Other applications include unfired pressure vessels, machinery of all kinds, truck frames, bridges and piers, water towers, freight cars, wrought iron fabrications, etc. Let an actual test prove that it will give you better, faster welds at lower costs. Tell us your type of work and we'll send test samples without obligation. Write today.

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DECEMBER, 1954
VOL. 27 No. 12

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WELDING ARCS NEWS

WELDING FRAMES FOR DART TRUCKS (INSET) WITH G-E STRIKEASY 1 SAVES OVER

WELDING FOREMAN FOR DART TRUCK CO. SAYS:

"Speed?—G-E Strikeasy 1 electrode saves us 2

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. . . so says Mr. E. A. Gassman, Welding Foreman for the Dart Truck Co., Kansas City, Mo.—manufacturers of the world's largest dump trucks.

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STRIKEASY 1 IS EASY TO USE. A contact-type electrode, it forms a finely

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2 MAN-DAYS PER TRUCK. STORY BELOW.

man-days per truck!"

rippled bead when simply dragged over the job. Less skill is needed to hold arc length. All this means Strikeasy 1 helps cut down on operator fatigue—cuts training time for new operators.

Check your G-E welding distributor's name in the phone book, and ask him for the electrode information shown below. General Electric Co., Schenectady, N. Y. 710-19E

GEC-1231—Strikeasy 1 Bulletin; GEL-1196—Stainless-steel Electrode Wall Chart; GED-1634—Electrode Catalog

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G-E electrodes—industry's most complete line—provide better over-all results with a tested balance of speed, weld-quality, ease of use . . .

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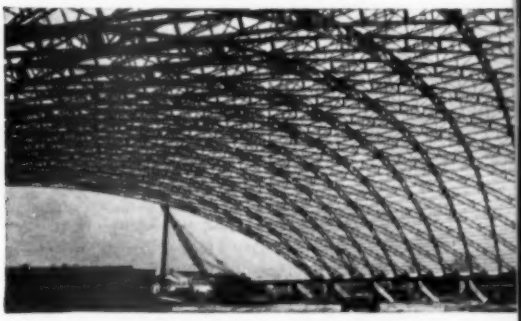

"PREFAB" ROOF is welded with G-E W612A, which reduces pinholing and slag interference in vertical-down work.

RUGGED EARTHMOVERS for tough mountainous duty are repaired crack-free with G-E W1016A low-hydrogen electrodes.

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Literature Featured In Ads This Month

CIRCLE ON ENCLOSED POSTCARD, NUMBERS OF LITERATURE YOU WISH TO RECEIVE

1 **Safety hat and welding helmet** combinations are featured in descriptive literature. JACKSON PRODUCTS. Inside Front Cover.

2 **Versatile new E6010** welding electrode is described in available catalog. HOBART BROS. CO. Page 1.

4 **Portable salamanders** and L-P equipment is featured in new folder. WELDIT, INC. Page 3.

22 **Complete guide** to successful low temperature brazing is available. AMERICAN PLATINUM WORKS. Page 4.

6 **Advantages of new contact-type** electrode are listed in Bulletin GEC-1231. GENERAL ELECTRIC CO. Pages 6-7.

7 **Low-price spot welding machines** that feature ruggedness and dependability are in Bulletin 324-2 which describes new SP-1 spot welder. SCIAKY BROS., INC. Page 9.

8 **Facts and figures** which illustrate efficiency of carbon arc-air gouging unit are included in free bulletin. ARCAIR CO. Page 10.

10 **Versatile clamps** which improve positioning and lifting efficiency are subject of bulletin. JAMES CAMPBELL SMITH, INC. Page 12.

5 **Complete line** of helmets, goggles, lenses and face shields are featured in Penoptic Bulletin. PENNSYLVANIA OPTICAL CO. Page 13.

13 **Inert arc welding chart** gives valuable welding hints and short cuts. SYLVANIA ELECTRIC PRODUCTS, INC. Page 15.

15 **Water-cooled inert arc welding torch** is featured in Catalog 2300. AIR REDUCTION SALES CO. Page 19.

17 **Hardfacing rods and electrodes** for every application are featured in Hard-Facing Manual No. 77. WALL COLMONOY CORP. Page 21.

33 **Versatile welding and cutting** torches are described in Catalog 20 which features 300 Series Torch Butts. VICTOR EQUIPMENT CO. Page 23.

19 **Uninterrupted automatic arc welding** with latest in labor-saving equipment is subject of Catalog and Data Sheets. REID-AVERY CO., INC. Pages 24-25.

20 **Specific advantages** of positioned welding can be found in illustrated circular WP26. CULLEN-FRIESTEDT CO. Page 26.

21 **Full story on metallizing** in production salvage work is told in illustrated Bulletin 57-C. METALLIZING ENGINEERING CO., INC. Page 27.

23 **The Hi-Amp story** is an interesting folder of data on electrode holders and ground clamps. WAGNER MFG. COMPANY. Page 30.

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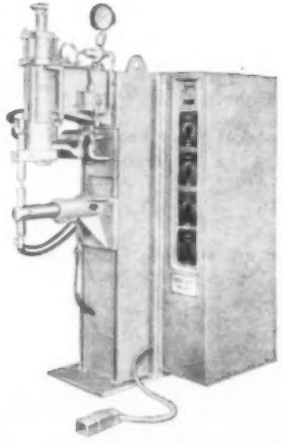

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The shop foreman at Olympic reports that this new fabrication method has been saving up to 20% in assembly time, by eliminating beveling of plates before fit-up and preparing both sides of the groove simultaneously.

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ARCAIR COMPANY
429 South
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Lancaster, Ohio

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(Continued from Page 8)

25 **Hardfacing wearing parts** with new tube rod is explained in literature offered. HAYNES STELLITE CO. Page 32.

26 **Cutting torch brochure** contains 40-pages of information on manual flame cutting. NATIONAL WELDING EQUIPMENT CO. Page 33.

28 **Fusion welding of Monel,** Nickel and Inconel is described in Bulletin T-2. INTERNATIONAL NICKEL CO., INC. Pages 38-39.

29 **Powder cutting of stainless steel** and other hard-to-cut metals with newly developed equipment is subject of bulletin. NATIONAL CYLINDER GAS CO. Pages 42-43.

32 **Resistance welding electrodes** are featured in booklet that contains latest information on resistance welding. W W ALLOYS, INC. Page 55.

27 **Three job-matched electrodes** which handle every job in the E6012 class are featured in literature offered. A. O. SMITH CORP. Pages 56-57.

34 **How to remove welding fumes at** the source is the subject of Bulletin 37-E on welding fume collectors. RUEMELIN MFG. CO. Page 62.

35 **Versatile nickel-silver brazing rod** that brazes 14 different metals is introduced. ALL-STATE WELDING ALLOYS CO., INC. Page 63.

36 **Submerged arc welding fluxes** for fabrication of stainless steels are subject of available literature. ARCOS CORP. Page 64.

39 **Automatic welder and positioner** for rebuilding worn circular shapes is subject of literature on Rex-arc Model RP43 unit. SIGHT FEED GENERATOR CO. Page 69.

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(Continued from Page 10)

41 **Balanced-type positioners** for high speed welding are featured. ARONSON MACHINE CO. Page 74.

44 **Complete line of welding** and cutting equipment is featured in new catalog. DOCKSON CORP. Page 78.

46 **Weld grinding and finishing** with high speed production electric tool is subject of illustrated literature and price list. FRANKLIN BALMAR CORP. Page 82.

50 **How to mark a center line** at any angle is subject of literature which features new centering head. CONTOUR MARKER CORP. Page 88.

52 **Quick disconnect electrode holders** and how they work is the subject of Bulletin No. 121. CAM-LOK DIVISION of EMPIRE PRODUCTS, INC. Page 90.

55 **Safety engineered trailer parts** are featured in Brochure 18-L. HAMMER BLOW TOOL CO. Page 93.

56 **Tip dressers for resistance** welding electrodes and how they save copper is story told in literature available. C. O. PORTER MACHINERY CO. Page 94.

18 **New line of air-inflated** grinding wheels which feature interchangeable contact drums is introduced in literature available. NU-MATIC GRINDERS, INC. Page 95.

59 **Stainless steel arc welding electrodes** are featured in brochure. ALLOY RODS CO. Page 101.

60 **Welding torches which swivel** to any angle are featured. SMITH WELDING EQUIPMENT CORP. Page 102.

Now! YOU CAN ORDER ANY OF THESE PENOPTIC SAFETY PRODUCTS DIRECT FROM THE MANUFACTURER . . .

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(Continued from Page 12)

62 **Cobalt-chromium-tungsten** hard facing alloys are featured in free Crobalite Bulletin. CROBALT, INC. Page 103.

63 **Eight models of industrial arc welders** are featured in illustrated descriptive literature. TRINDL PRODUCTS, LTD. Page 103.

66 **Tong-test ammeter** is subject of of Bulletin IW-400. COLUMBIA ELECTRIC MFG. CO. Page 105.

67 **New bar clamps** with hinged foot that swings clamps to and from work are featured in catalog. ADJUSTABLE CLAMP CO. Page 105.

71 **Aluminum arc welding electrodes,** welding and brazing wire and spooled aluminum wire for inert arc operations are all featured in available literature. MORGAN ALUMINUM WELDING ROD CO. Page 107.

73 **How to save money** using 11 to 13 percent manganese - nickel steel in repair and rebuilding operations is subject of Manganal Marketer. STULZ-SICKLES CO. Page 108.

74 **Cast iron welding** with low temperature rods and electrodes are featured. EUTECTIC WELDING ALLOYS CORP. Page 108.

79 **All-purpose brazing flux** is offered for use in sample lots. JOHNSON MFG. CO. Page 110.

80 **Anti-spatter compound** is offered for use in sample lots. MIDLAND PAINT & VARNISH CO. Page 110.

83 **Tungsten arc welders** that are electrically controlled are featured. MILLER ELECTRIC MFG. CO. Page 111.

85 **Lightweight air hammer** that removes weld scale and spatter in a hurry is featured. SUPERIOR PNEUMATIC & MFG., INC. Page 112.

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Norton BFR Semi-Flexible Hub-Type Wheel smooths a welded radius. Strong, safe and versatile like all Norton Reinforced Wheels, the BFR is best for lighter weld grinding applications. Like the BD it notches, slots and cuts off.

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W-1564

Norton BD Rigid Hub-Type Wheel smooths a flame-cut edge. This heavy-duty Norton Reinforced Wheel is also excellent for cutting-away, smoothing heavier welds, making V-cuts for removing old weld material, etc.

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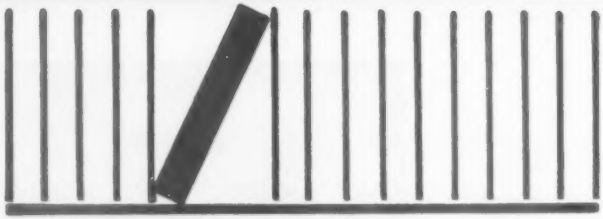

useful free literature

The publications featured on these pages were written by experts. They are FREE to our readers. To obtain these helpful reference materials use the postcard bound into this issue.

RESISTANCE WELDING ALLOYS for your various needs are described in a new booklet offered by Acme Electric Welder Co. Catalog No. 504 gives dimensions, specifications and engineering drawings of resistance welding tips, holders, wheels, discs and accessories. **Circle No. 90 on Reader Service Card for more information.**

PORTABLE ELECTRIC TOOLS FOR WELDING GRINDING are described in Folder SP-2 offered by Milwaukee Electric Tool Co. Explained in detail in the illustrated folder is the grinders' clutch-drive feature which absorbs back-lash shock of heavy and unbalanced grinding wheels. **Circle No. 91 on Reader Service Card.**

WELDING FUME COLLECTORS, blast cleaning machines and dust filters are featured in an illustrated booklet published by Ruemelin Mfg. Co. The booklet gives specifications for the various pieces of equipment made by the company. **Circle No. 34 for your copy.**

NEW DC RECTIFIER WELDERS rated at 300 and 400 amps are introduced in 8-page catalog GEA-6242 issued by General Electric Co. Complete operating data and specifications are listed in fully illustrated catalog which describes in detail welders' features, including fulltime arc-force control and combination cleaning-cooling fan. **Circle No. 92 on Reader Service Card.**

UNINTERRUPTED AUTOMATIC ARC WELDING is the subject of catalog and data sheets offered by Reid-Avery Co., Inc. Described and illustrated are a complete line of welding wires, wire reels and automatic controls and heads for submerged arc welding. **Circle No. 19.**

STAINLESS STEEL WELDING WIRE in spools, coils and lengths are listed in price lists and data sheets offered by Drawalloy Corp. Featured is a complete line of stainless steel wire for automatic and semi-automatic gas and inert arc welding applications. **Circle No. 57 on Reader Service Card.**

QUALITY RESISTANCE WELDING with long life electrodes is subject of literature offered by Tipaloy, Inc. Folder describes long life of these electrodes and tells why they give a maximum number of welds before requiring redressing. **Circle No. 51 on Reader Service Card.**

SPECIFIC ADVANTAGES OF POSITIONED WELDING are featured in Bulletin WP26 offered by Cullen-Friestedt Co. The illustrated circular explains how hand or powered welding positioners can increase speed and efficiency of welding operations. **Circle No. 20 on Reader Service Card for more data.**

INFORMATION ON RESISTANCE to corrosion, abrasion, and impact at normal and elevated temperature is offered by Crobalt, Inc. This literature will give you information on Crobalite hard-facing alloys. It explains how these alloys can be heated to 1600° F. without permanent loss of hardness and why they are not affected by repeated heating and cooling. **Circle No. 62 on Reader Service Card for your copy.**

NOW! A WATER-COOLED HELIWELD HOLDER

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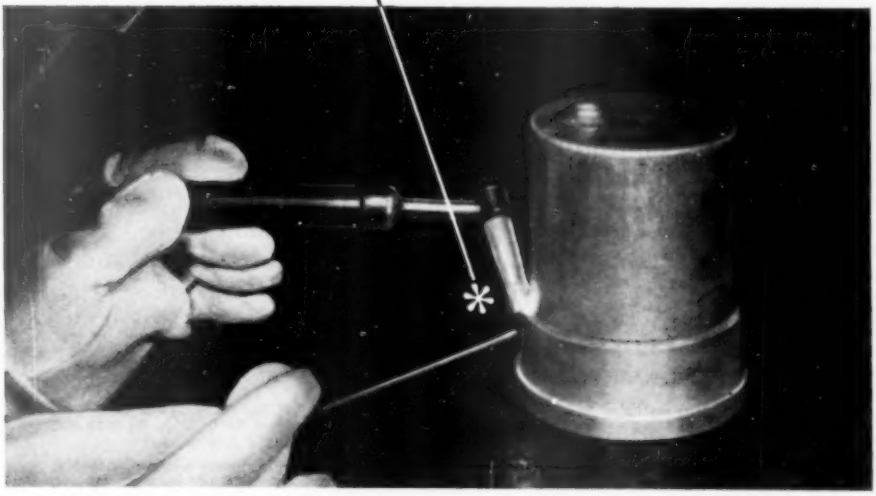
This brand-new, water-cooled Airco Heliweld holder gives you quality welds in thin-gauge aluminum, stainless steel, magnesium and copper alloys with ease and convenience . . . and at a highly attractive price. Weighs only four ounces and is 7½ inches long. Continuous duty rating of 125 amps AC or DC. Ideal for long-run jobs, and for welding in tight corners. Gastight "O"-ring seals in the nozzle and cap assembly. A full selection of collets and ceramic nozzles . . . no arc-shorting in confined areas! Price includes holder, collet, nozzle, cap assembly and cable assemblies . . . with no sacrifice in usual high Airco quality.

See your Airco dealer, or write today for Catalog 2300, "Airco Heliwelding Equipment."



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Circle No. 15 on Reader Service Card.

HOW TO WELD LARGE DIAMETER STUDS—is completely covered in a new, profusely illustrated manual issued by Nelson Stud Welding Division, Gregory Industries, Inc. All details involved in getting the highest possible efficiency and performance from Stud Welding are simply described and illustrated with carefully prepared diagram and sketches. **Circle No. 93.**

A NEW LINE OF CUTTING TORCHES developed by Smith Welding Equipment Co. is featured in a new bulletin. This line is described as combining light weight with heavy cutting capacity. Operating data and specifications are given. **Circle No. 94 on Reader Service Card.**

ALUMINUM APPLICATION CHART offered by Arcos Corp. can give the answer to your aluminum joining problems. Complete information is given on use of the company's new line of coated and bare aluminum rods and electrodes that are available in coiled, cut or spooled form. **Circle No. 37.**

CARBIDE AND ABRASIVE TOOL SHAPES are listed on a 35 x 24-inch wall chart available from Metal Removal Co. The "shape identification" chart illustrates in actual size the various shapes of the company's mounted points. Carbide burr shapes are also illustrated, with dimension and prices listed. **Circle No. 96 on Reader Service Card.**

SUCCESSFUL SILVER BRAZING is no problem if you follow instructions given in a guide book offered by American Platinum Works. "A Complete Guide to Successful Silver Brazing" gives application data on low temperature silver brazing along with step-by-step instructions. **Circle No. 22 on Reader Service Card.**

The most revolutionary achievement in arc welding equipment in years!

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MODEL 200 AW
Patent — Pending

FIRST TRULY PORTABLE 200 AMP. OUTPUT ARC WELDER

Weighs only 65 lbs . . Carry it to the job!

OBSOLETES ALL OTHER WELDERS OF COMPARABLE RATING

Dimensions: 11" x 12" x 7½"

Sensational new transformer development produces far more power to pound! The BREN/WELD does work of conventional welders 4 or 5 times its size and weight . . . Actually delivers up to 250 amps at reduced duty cycle.

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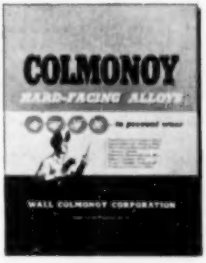
Two great alloys, Colmonoy No. 1 and Colmonoy Special No. 1, now have a new metallic coating that improves weldability and arc stability. No weld cleaning is necessary between successive passes, and welding may be done vertically. New moisture-proof cans keep rods fresh. Use No. 1 for high impact applications, and Special No. 1 for extreme abrasion resistance. Available in 1/8", 3/16", and 1/4" diameter electrodes, for DC electric arc welding.

Write for Colmonoy Hard-Facing Manual No. 77.



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SPATTER-PROOFING COMPOUNDS which make weld cleaning a breeze are described in literature offered by G. W. Smith & Sons, Inc. Described in detail is a money-back trial offer. **Circle No. 38 on Reader Service Card.**

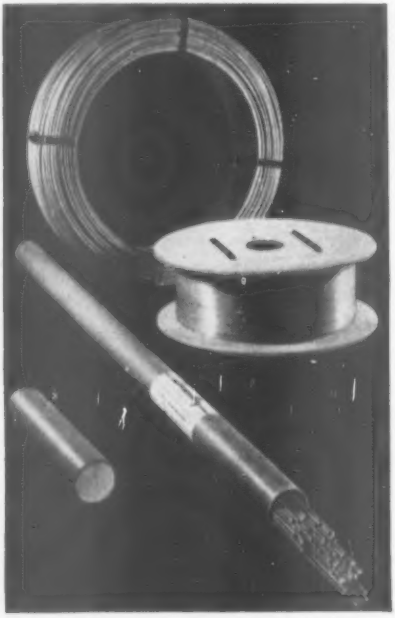
HANDY ELECTRODE SELECTOR CHART is available from McKay Company. The chart catalogs properties and uses for all McKay's mild steel, special purpose, hard surfacing and stainless steel eleectrodes. **Circle No. 97 on Reader Service Card.**

MONEY SAVING WELDING CHART offered by Sylvania Electric Products, Inc., gives valuable hints and short cuts on inert arc welding and describes line of tungsten electrodes. Chart tells what to do about difficult starts, brittle tips and contamination. **Circle No. 13.**

REINFORCED DISC-WHEELS for weld grinding are introduced in literature offered by Bay State Abrasive Products Co. An illustrated brochure explains how Saf-T-Cut "BZ" disc-wheels are reinforced with multilayer fiber glass and specially treated nylon for increased strength and wear-resistance. **Circle No. 11.**

WELDING FUME EXHAUSTERS can remove obnoxious fumes and odors. Portable and stationary fume exhaust units that feature unlimited flexibility and fast, easy positioning are described in application data offered by Engwald Corp. to introduce their new W-200 series. **Circle No. 64 on Reader Service Card for more information.**

VISE-TYPE PLIERS, which hold parts securely for welding, grinding and cutting, are featured in an illustrated brochure offered by H. R. Basford Co. Described in detail are easy-to-use Gripso pliers which are copperplated for protection against spatter. **Circle No. 100 on Reader Service Card.**



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QUALITY CONTROLLED
STAINLESS STEEL
Welding Wire

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Welding wire by Drawalloy is made to an exacting high standard . . . a high standard established by long-experienced welding men who know welding wire and how it must work. Set-ups for automatic and semi-automatic welding take more time than regular welding. That's why you want to be sure of satisfaction *before* you start. This *reliable* wire is weld-tested to give the best results every time. Write today for complete information and prices.

WELDING SUPPLY DISTRIBUTORS: Get prompt delivery on all sizes and grades of stainless and tool steel wire for gas and inert arc welding.

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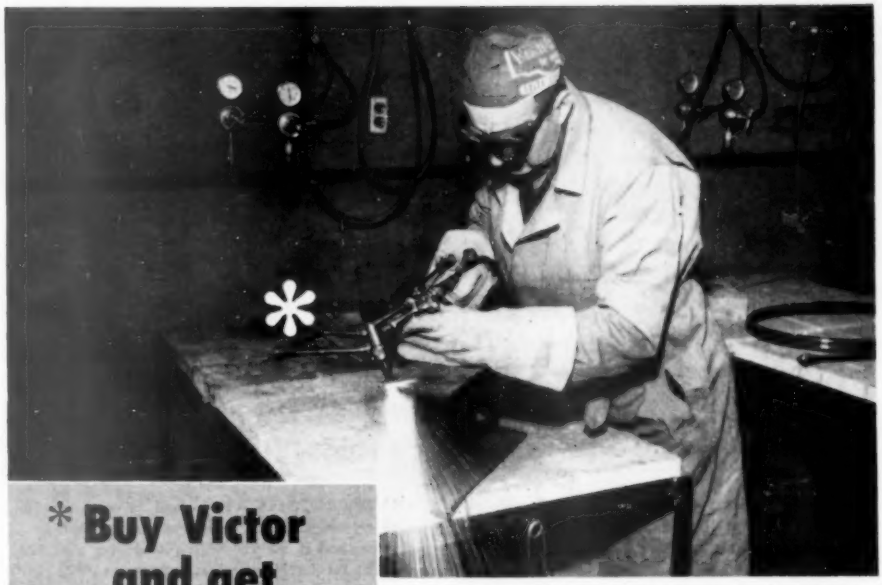

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The versatility of VICTOR torches means you can buy exactly what you need for today's job, then add other nozzles, tips and attachments as required. Your equipment grows with your needs; stays custom-fit to your work. For example, here are a few of the 34 standard attachments for VICTOR 300 Series Torch Butts.

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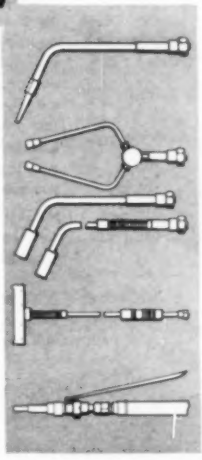

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Here's one of 10 standard single-tip nozzles available for general welding and preheating.

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You have your choice of 11 standard multiple-tip or multiflame nozzles for preheating, brazing, silver soldering, etc.

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Save time and money with VICTOR attachments that fit your exact needs.

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Shuts off welding gas, keeps pilot light on, saves as much as 75% of total gas consumption.

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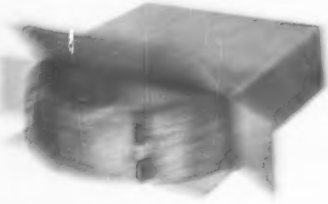

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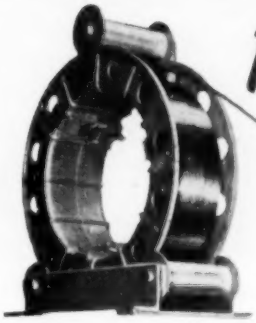
RACO COMPOSITE TYPE "A"

Heavy Coated Open-Arc Electrode. Available in mild steel, low alloy-high tensile, low hydrogen, hard surfacing and stainless steel grades. Two other grades for open-arc welding—RACO TYPE "D" with white flux coating and RACO TYPE "M9" (knurled) with red flux.



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The New RACO Model BW-2

Outstanding features are:

1. Adaptability to any job . . . nozzle can be positioned 360° in two planes.
2. Simplified control for either standard or constant potential welders, AC or DC.
3. Easy to install . . . just plug in head and hook up welding cables.
4. Available with various nozzles and attachments for submerged-arc, gas-shielded arc, or open-arc welding of all kinds. Also duplex nozzles and feed rolls for twin arc-welding.
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Weldors spend more time welding—do better welding at lower cost when they work with C-F Positioners because these hand and/or power operated machines reduce positioning time to a minimum. Investigate the cost-saving advantages of C-F Positioners. They pay their way in any company.

Write for Bulletin WP26—an illustrated circular detailing the *Specific* advantages of C-F Positioners.

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CULLEN-FRIESTEDT CO., CHICAGO 23, ILL.

C-F positioned welds mean better, more economical welds

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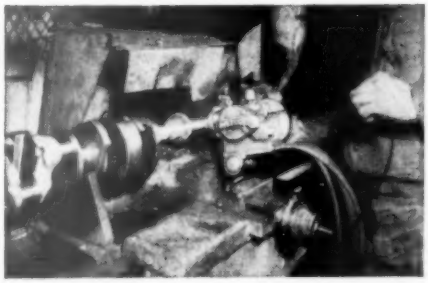
when mistakes happen...



Automotive crankshaft being brought up to inspection standards with metallizing. This automotive manufacturer formerly used plating for this type of salvage, worked one per hour. With metallizing, the salvage operation requires only 5 to 10 minutes per shaft, including surface preparation.

...and they do in any busy machine shop, there's no need to scrap a mis-machined or otherwise damaged machine part that represents an investment of many expensive man-hours.

Parts like these are brought up to inspection standards quickly, easily and inexpensively with metallizing.

And with the new molybdenum metallizing wire, Sprabond, the only surface preparation required is cleaning. The molybdenum forms a molecular bond with the surface being rebuilt. Little heat is generated, eliminating any danger of warpage.

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The trade name, SPRABOND WIRE, is the property of Metallizing Engineering Co., Inc.

Free Bulletin

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☐ Please send me Bulletin 57-C.

☐ Please have Metco Field Engineer call.

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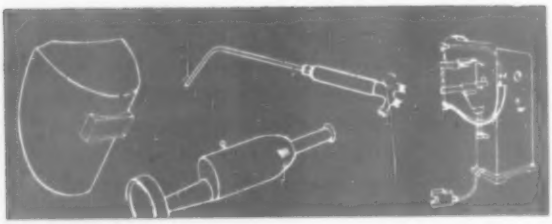

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This "Equipment Index", compiled for easy reference, represents only those advertisers **in this issue** whose product information was available prior to our closing date. All of our advertisers, however, are prepared to supply you with full particulars regarding their equipment, services and materials necessary to most effectively carry out your welding program.

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WITH
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Ask your CESCO Safety Equipment Distributor for further information and prices on new CESCO No. 548 and 549 Weldors' Helpers' Goggles, or write us.

CHICAGO EYE SHIELD COMPANY
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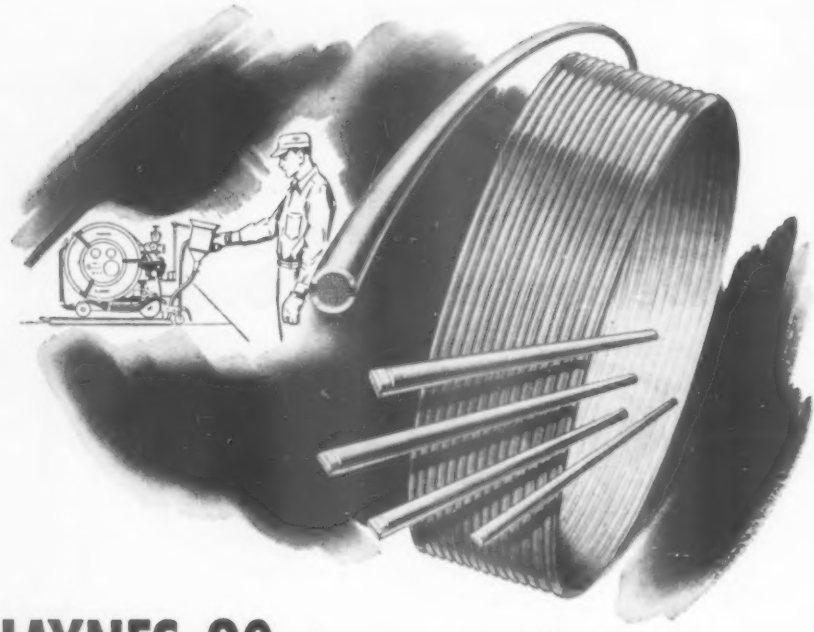

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HAYNES 90 tube rods are available in two forms. They can be obtained in 14-in. lengths for fast, easy manual deposition. They are available in coils, too, for use with mechanized equipment.

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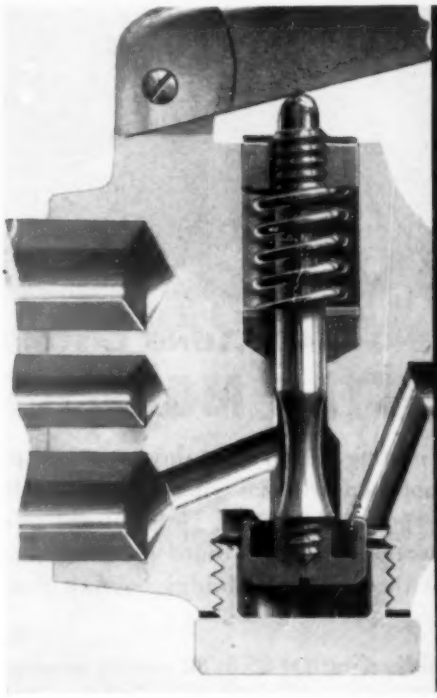

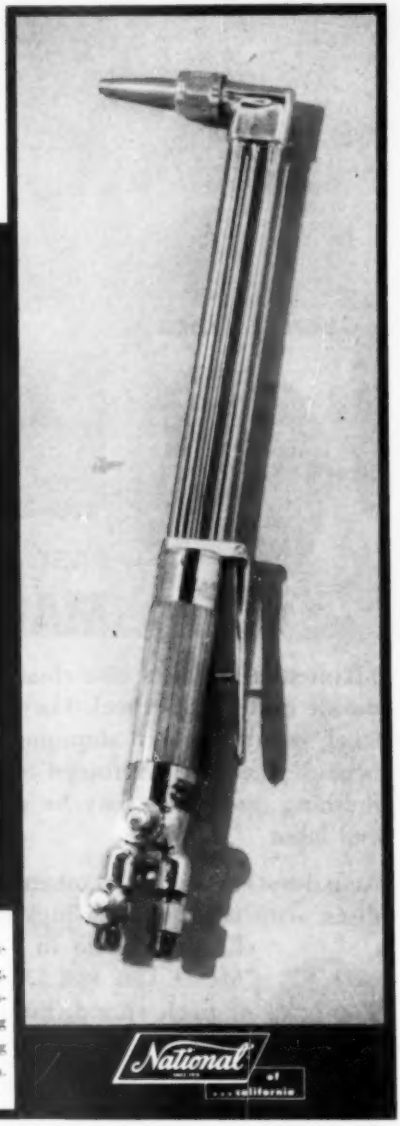

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Actual tests show that Manhattan Moldiscs outlast 25 to 30 coated sanding discs, with additional savings in down-time normally required for disc changes. Made in various resiliencies and bond types. For "MORE USE PER DOLLAR," specify Moldiscs and other types of high speed, heavy duty Manhattan Abrasive Wheels.

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Stainless steel test specimens are made on seam welding machine.

WELDING RESEARCH

. . . for higher efficiency, lower costs

by Orville T. Barnett,
Welding Research Supervisor, Armour Research Foundation
Illinois Institute of Tech.

IT didn't take much of an arc to show the pot of gold in a recent welding project through a shade fourteen lens. Within twelve months a successful welding process promised a million dollars worth of competitive advantage in a swiftly expanding market. If the method took three years to become practical, it might not be worth two cents. That's why the executive vice-president insisted on a "shorthair" welding research program with a premium placed on speed.

On the other hand a government sponsor wanted the fog of conflicting theories pierced by the radar of fundamental research. Practical applications of discoveries should be mentioned in monthly reports but not pursued. Through this tortoise-like approach, he predicted, the race for knowledge covering this one of the eight welding processes would be

won over the hare of specific application answers. As this program now enters a fourth year, the flood tide of new information is establishing the sponsor's reputation as a seer.

This seeming paradox between the need for practical (shorthair) research and the long range investment in fundamental (longhair) research is fused into a working partnership in the Welding Research Section of the Metals Research Department. With exciting frequency Monday's fundamental discovery is the missing fact needed for Tuesday's practical solution.

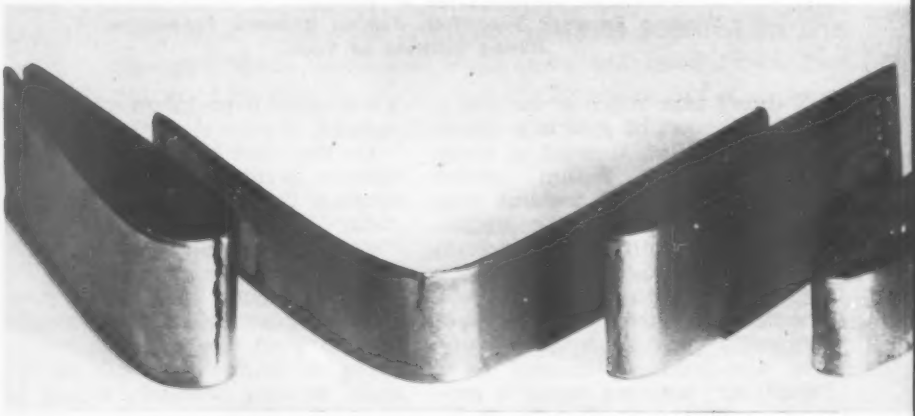
Consult With Specialists

Joining research—welding, brazing, soldering—begins when something can't be done. With a detailed knowledge of what he "can't do" the prospective sponsor usually arranges a conference at ARF to present his problem without obligation. Here he meets with as many specialists (welding engineers, physical metallurgists, mechanical metallurgists, electrical or mechanical engineers) as may be required to appraise the points to be solved. As the many facets are brought to light, other qualified engineers may be asked to participate in the discussion.

This first meeting decides the future course of action. Sometimes the answer is obvious to one or more of the assembled specialists and the matter is immediately resolved at no cost to the prospective sponsor. Infrequently the project is too involved to permit an economic solution. On occasion a problem must be declined because it conflicts with similar studies being made for another sponsor. Most often, however, a proposal for a research program results. This research proposal states the problem, outlines the general plan of attack and estimates the cost both in money and in time.

Once the proposal is accepted and becomes a research contract, the battle of creative thinking and

Bend tests are made to evaluate welded titanium sheet (below) while . . .



experimentation is initiated against two formidable foes: money and time. By discussing some of the welding projects briefly, the people and the means marshalled for this effort may be better understood.

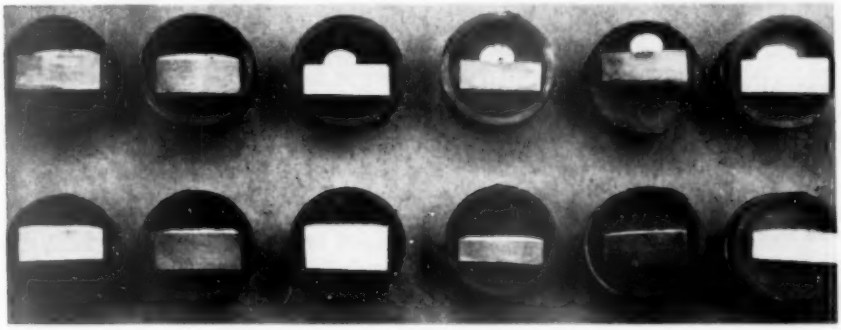
One fundamental arc welding research utilized high speed motion pictures to study arc phenomena. While this approach was by no means novel, it was essential to this project. And the ready presence of equipment and skilled personnel in the ARF Physics Department for such photographic work saved valuable money and time for the sponsor. At least one patent is being prosecuted by this well known industrial sponsor out of the many ideas discovered in this program.

Predict Burn-off Rates

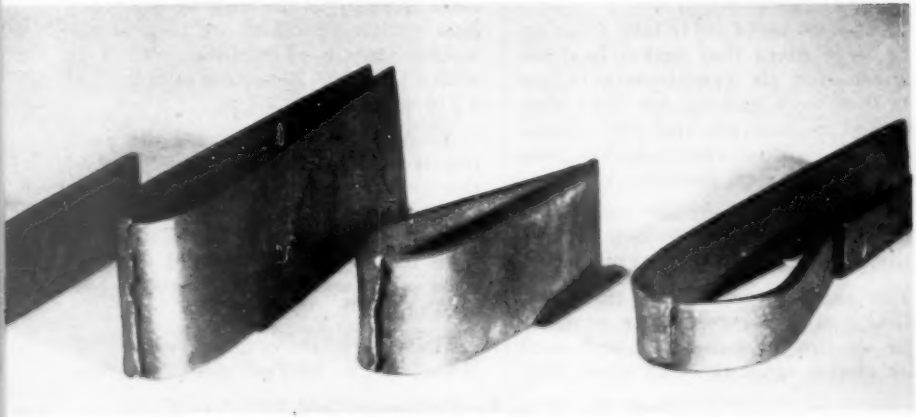
Thermodynamics, electrical engineering and mechanical engineering seasoned with mathematics enabled the scientists to predict burn-off rates with precision. The growing application of semi-automatic welding is related to this work.

Another fundamental arc welding project has used the inert-arc

(Continued on Page 39)



. . . brazing alloys are rated by series of wettability tests (above).



Nick gets a couple of cool receptions

It was the start of that real hot spell we had last summer. I had to catch a train and Goldie was out front honking the horn to hurry me up. I was in the attic taking a last minute look for an old electric fan she had asked me to get down weeks ago.

I couldn't find the darn thing anywhere, so I had to talk fast all the way to the station to keep her from asking. It's not the easiest thing in the world to out-talk Goldie, so I was feeling pretty good when the train pulled in.

The boss wanted me to take a run up to a large plant that makes heat exchangers for air conditioners to see how they were making out since they switched to inert gas and "60" Monel Wire for welding copper-nickel tube sheets to some steel flanges.

When I walk into the air conditioned plant, I see they have a whole battery of inert gas metal-arc welding machines.

The shop foreman says right off, "Mind you, we were getting good results on this copper-nickel and steel joint, hand welding with your '130' Monel electrodes. But now with this spooled '60' Monel Wire in these new machines we're getting *sound welds, and in half the time.*"

Then he shows me some of the copper-nickel tube sheets joined to steel flanges on the end of these big heat exchangers. And we look at the welds. They use .062-inch "60" Wire with a 70 argon- 30 helium mixture and a 270 amp current.

You could practically *see* the good physical properties of the welds. And this foreman says, "That's even greater penetration than we were getting . . . despite the fact it's faster welding. Besides that, we use less metal, because there's less waste. Clean deposits, too, aren't they?"

They sure were. And with "60" Monel Wire they're also corrosion-

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resisting just like solid Monel®. That's important because the heat exchangers circulate corrosive brine.

I could see there wasn't much I was needed for around here, but I hated to leave that cool plant and get on the hot train.

On the way back, I got to thinking about Goldie and that fan. Sure enough. The reception I get is even *cooler* than when I walked into the air conditioned plant.

Goldie says right off, "I found the fan. The one you were going to get out. It's broken!"

I'd thought the answer out on the train back. "Toss it out, honey. Tomorrow we'll order an air conditioner."

Brother! Give me welding problems any day.

Got any yourself? Remember, if you want help on how to weld one kind of metal to another, just write me about it. And don't forget Inco has a complete line of welding materials to choose from. We also have a new edition for you of T-2, our bulletin on fusion welding.

Yours for better welds,

Nick Rodder

THE INTERNATIONAL NICKEL COMPANY, INC.
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process for welding titanium and titanium alloys. This precocious six year old among the light metals in large scale industrial production is allergic to many things. While the pure metal and some alloys may be welded by inert arc and resistance welding methods, other useful alloy combinations suffer irreparable damage from welding heat cycles.

Tests on Titanium

So this basic study is charting unknown seas of titanium welding knowledge through a painstaking study of three typical alloy structures preheated and postheated as part of the welding process. The new alloys were melted at ARF by the nonferrous metallurgy section to achieve a uniformity that is not yet possible in commercial production. Cleaning, forging, remelting, rolling and welding procedures were meticulously established by skilled physical metallurgists to avoid surface contamination and to assure high yields of expensive product. Since this difficult problem was made even tougher by purposely adding increasing amounts of contaminants, the high percentage of successful first runs was a tribute to the titanium specialists in the department.

Several thousand mechanical tests for strength, ductility and hardness were conducted along with thorough co-ordination of microstructures. Using many heat treating cycles to extend the useful welding application of titanium alloys is but one of the goals of this work.

In January the author explains other welding research projects conducted by Armour, including work with inert arc, carbon arc and resistance welding.

INDUSTRY AND WELDING ATTENDS A PLANT OPENING

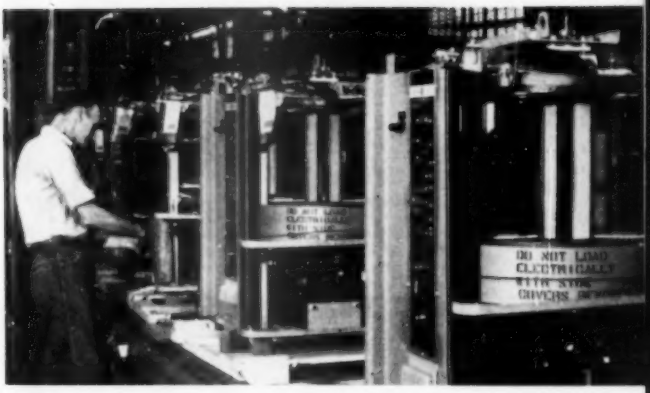
OFFICIAL opening of the General Electric Company's welding equipment plant held recently in York, Penna., represents completion of a major expansion program for the Welding Department, says R. C. Freeman, general manager.

According to Mr. Freeman, new facilities at York make possible complete integration of the Welding Department's equipment manufacturing operations. This includes a new line of AC, DC rectifier-type welders, as well as DC engine driven and motor generator welders, and equipment for consumable electrode, gas-shielded welding.

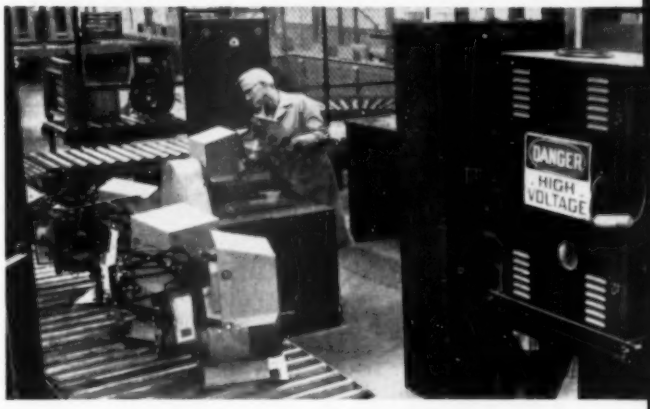
Layout of manufacturing facilities at the plant is "U" shaped. Assemblies flow along three main production lines on one side of the "U", onto a common conveyor which carries them across to the sheet metal and finishing areas. Proceeding down other side of the "U", welders are crated and shipped.

Basic design of the plant provides for storage of materials and production of sub-assemblies at the point of use. Where this is not possible, parts are carried to the assembly lines by conveyors.

Three dimensional plant layout is inspected by R. C. Freeman (right), general manager of G.E.'s Welding Department, and C. I. MacGuffie, department marketing manager.

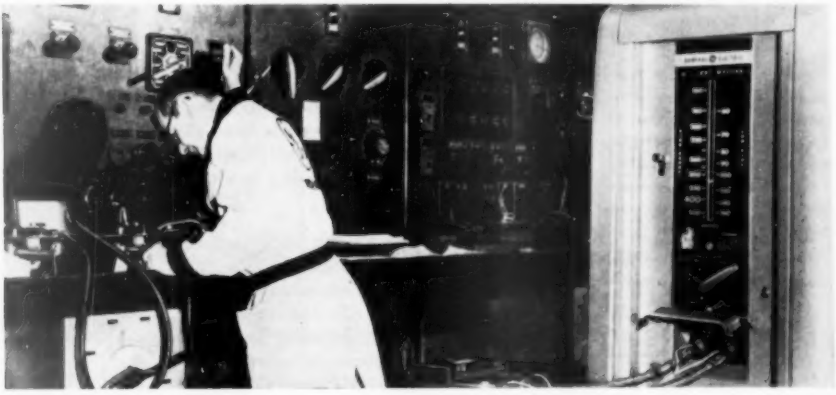


New rectifier-type welders move down assembly after preliminary testing.



Motor generator welders undergo exhaustive electrical tests prior to shipping.

Performance test is made on new AC welder. Output, efficiency, power factor and other electrical characteristics are checked.



NCG Torchweld® torches for Ferrojet cutting are available in models for either machine or hand cutting. Illustration shows the Ferrojet machine cutting torch adapted to the NCG Cut-O-Matic® portable cutting machine.

Riser pads on this stainless steel casting are being removed in half the time with the Ferrojet flame washing torch. It may also be used for removing cracks, chill bars, fins and sand inclusions from stainless and high alloy castings.

NCG FERROJET® Dispenser teams up with CUT POWDER-CUTTING

Mounted on a standard, two-wheel gas cylinder truck, the dispenser plus a cylinder of either compressed air or Nyrogen® make a mobile, easy-to-handle outfit. Dispenser does not require electricity . . . can be operated anywhere.

NCG Ferrojet Dispenser costs up to 70% less than expensive makes . . . gives unsurpassed performance

If it were possible for you to compare all the various powder dispensers, right in your own shop, on your own work, you would probably choose the NCG Ferrojet Dispenser. Here's why:

You save up to $600 on each dispenser you buy, because NCG's simplified dispensing principle provides a uniform flow of powder without using a complicated powder feeding mechanism. But low price is only half of the story.

Even more important than initial savings is its outstanding performance. For no other dispenser, regardless of cost, is capable of delivering more precise or uniform flow of powder. (And uniform flow, of course, is the basis of successful powder cutting.) No other dispenser is as easy to operate and maintain.

CHOICE OF TWO MODELS

In the automatic Model 301 Ferrojet Dispenser, gas pressures and amount of powder flow are maintained automatically. Special powder control operates simultaneously with turning-on and shutting-off of cutting oxygen valve on torch. Powder flow must be turned off manually on semi-automatic Model 302 Ferrojet Dispenser.

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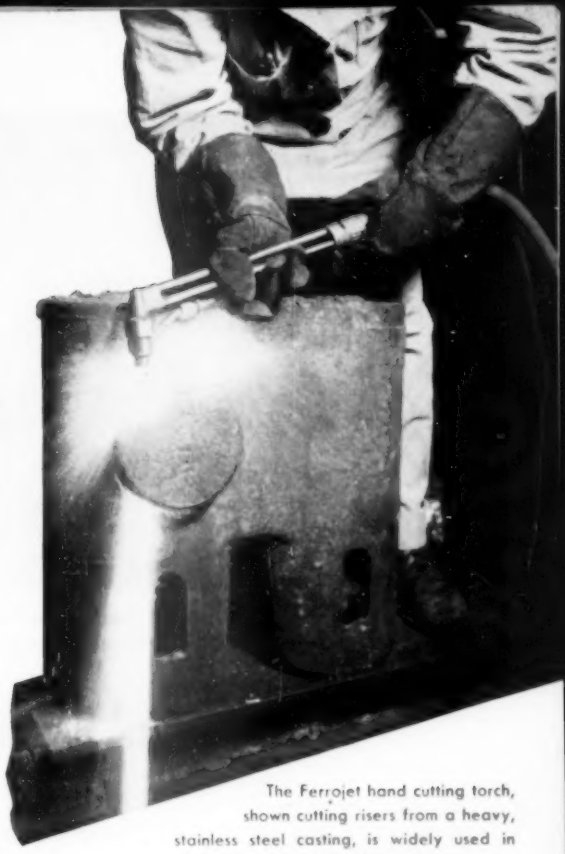
Ferrojet equipment is readily adaptable to machine cutting operations. Here a large diameter is being Ferrojet-cut from a 5½" thick plate by one of the country's large producers of cut-to-order stainless steel shapes.

new type powder to COSTS...



The Ferrojet hand cutting torch, shown cutting risers from a heavy, stainless steel casting, is widely used in foundries, fabricating plants and in scrapping operations. Tips are available for Ferrojet-cutting up to 16" thicknesses in steel.

Amazing new NCG Ferroflame® Powder speeds cutting and washing, reduces powder consumption

Unlike ordinary ferrous powders that are made up of solid, relatively thick particles, the revolutionary new NCG Ferroflame powder consists of tiny spheres crushed into extremely thin flakes.

The greater surface area of these flakes, as contrasted to solid particles, makes Ferroflame powder burn much more rapidly and with a higher concentration of heat. This means faster, easier cutting and reduced powder consumption.

NCG Ferroflame powder is available in two types: Type A for general purpose cutting, and Type B for washing operations. Both types packed in air-tight 100-lb. containers.

NCG®

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EVERYTHING FOR POWDER-CUTTING FROM ONE SOURCE!

You get all four with NCG—equipment, gases, powder and skilled technical assistance. Find out more about this complete powder-cutting service. Phone or write your nearest NCG representative or dealer, or write for information.

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After silver brazing alloy and cobalt-base insert have been preplaced, cleaned and fluxed assembly is placed in induction furnace.

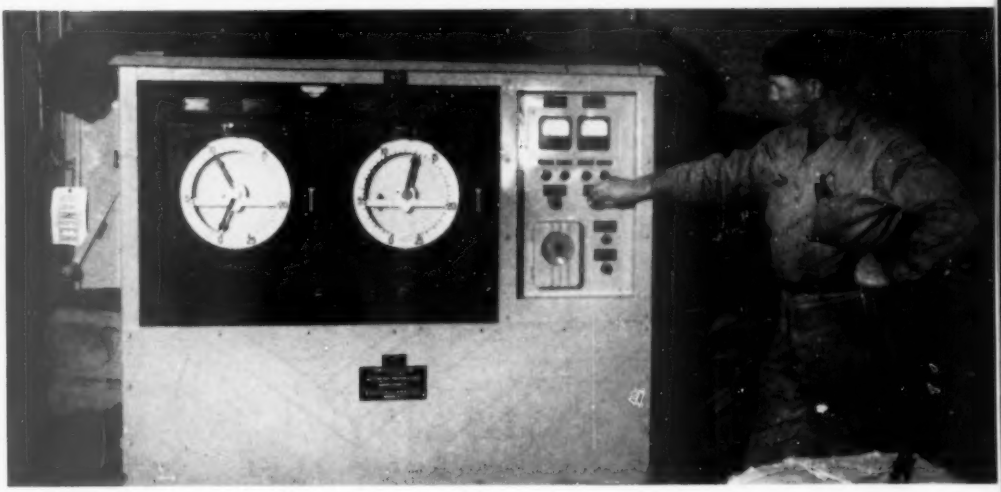
Induction Brazing Reduces Cost of

by Dorsey B. Thomas,
Union Bag & Paper Corp.,
Savannah, Georgia

Cobalt-base insert brazed on cutting edge of wood chippers boosts service life by 50 percent

THE pulp and paper industry has long been aware of the high cost of keeping wood chippers in operation. This is a tangible expense apparent through customary cost accounting records. However, the greatest expense to the pulp manufacturer is the chipping capacity lost during knife and bed plate changes and, the questionable chips produced after the plates have begun to wear beyond a safe radius.

Over a period of years, it has become obvious that the outlay of labor and material for the maintenance of ten-knife Murray wood chipper bed plates has been far in excess of what would reasonably



Induction heating unit holds entire assembly at 1300°F during brazing. After brazing, assembly is cooled uniformly to prevent distortion.

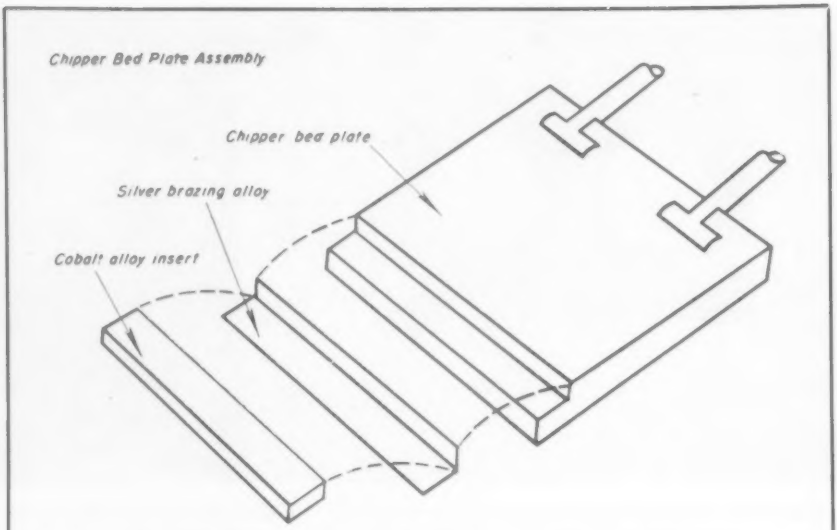
Hardfacing Operation by 76 Percent

be considered proportionate considering the simplicity of the equipment involved. Consequently, for the past two years we have conducted experiments toward increasing the service life (hours of operation between sharpening) and reducing the fabricating cost of chipper bed plates.

Originally, our practice was to use a factory-fabricated bed plate at a cost of approximately $85. This plate gave 35 hours of service. In view of these figures, we thought it should be economically feasible to shape-cut a mild steel plate and overlay the cutting edge with a hardfacing alloy. A plate treated in this manner would provide at least an equivalent service life to that of the factory plate at reduced fabricating cost.

A number of experiments were conducted in this direction using several recommended alloys. This resulted in a plate that was superior to the factory plate by five hours service and cost 25% less. While we felt that this was a substantial saving, the labor cost of fabricating the plate was now 57% of the total cost. We felt that a further saving could be effected. Since the overlay was being made as economically as was possible, the idea occurred that installation of an insert of the same alloy using the induction brazing process would reduce the labor cost to a greater extent.

At this point we secured inserts from several of the leading producers of special alloys. After thorough trial, we found that a ⅛-inch thick cobalt-base rolled alloy, stress relieved, provided the most



Relationship of cobalt-base hardfacing insert, silver brazing alloy and chipper bed plate are shown in this sketch.

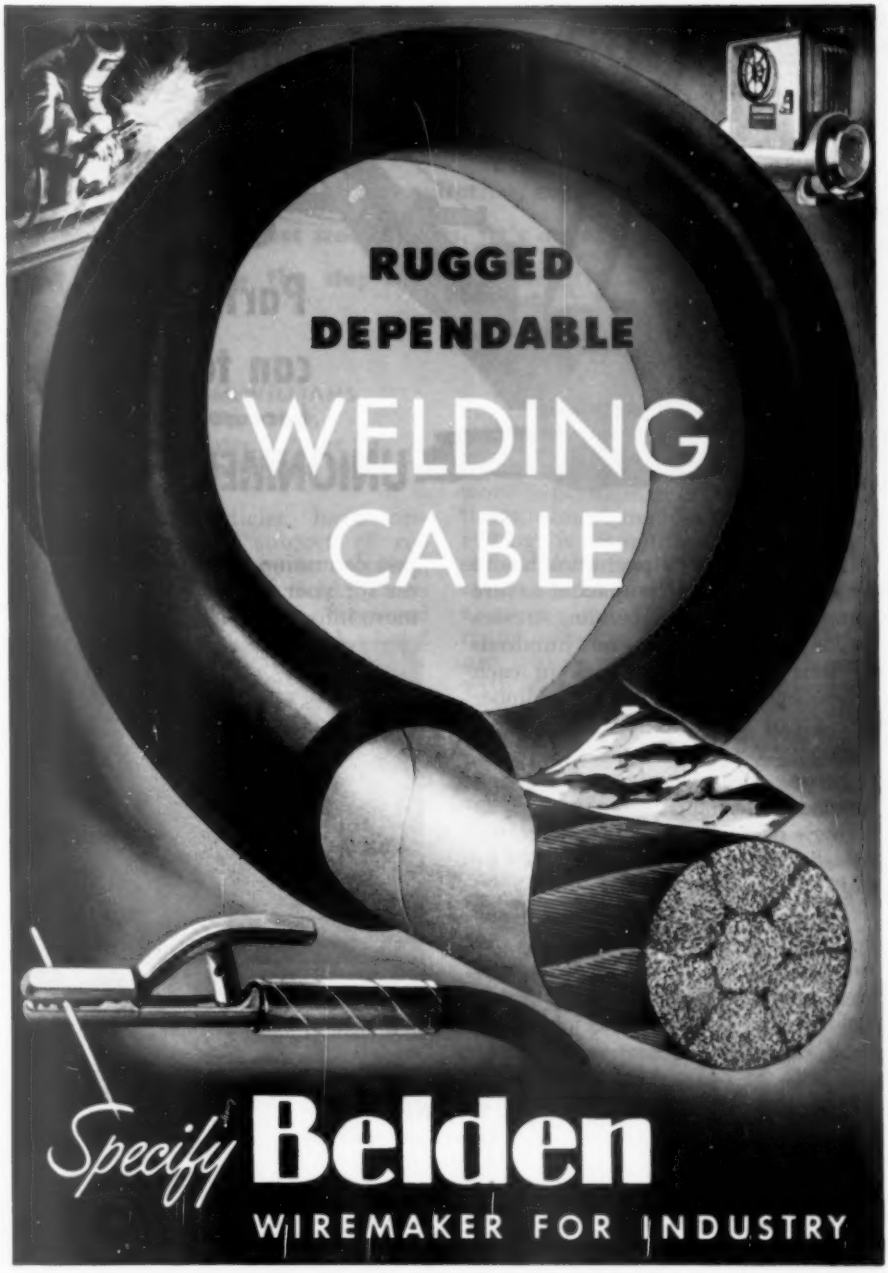
economical service. This rolled alloy proved to be most satisfactory since rolling gave a dense grain structure which increases the hardness of the alloy far above that of a cast alloy of the same analysis. This procedure resulted in a 76% reduction in labor cost and a 50% increase in service life. Still more important is the fact that the extended life of the plate puts its required changes more in line with those of the chipper knives.

We are convinced that this tremendous reduction in labor cost while fabricating a bed plate, which delivers 60 hours service, represents an approach to the maximum efficiency in the manufacture of this particular equipment.

Here's how it's done:

A recess ⅛" x 2" x 15¾" is machined into the cutting edge of the mild steel bed plate. This recess, after thorough cleaning with carbon tetrachloride, is coated with diluted silver brazing flux. A ribbon of Grade 50 silver brazing alloy .005" thick x 2¼" wide to provide turn-up for the back edge of the insert is fitted into the recess to receive the insert. The cleaned, fluxed insert is then placed on the brazing alloy and the entire assembly is placed in the furnace which is automatically held at a temperature of 1300 F.

In from 8 to 12 minutes the alloy becomes fluid and the insert is moved slightly from side to side to insure thorough tinning. After relocating the insert in the proper position in the recess the complete assembly is moved to the front edge of the furnace where the brazing alloy solidifies almost immediately. The complete assembly is then placed in a container of insulating material which allows it to cool uniformly to prevent distortion.



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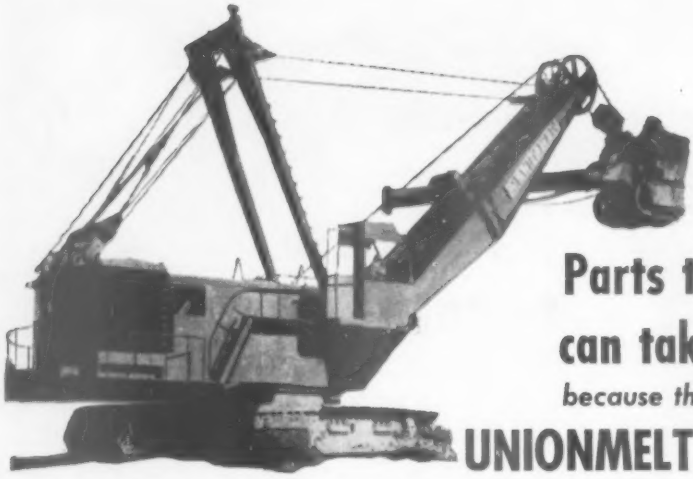

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How Welding Cures A "Sick" Turbine

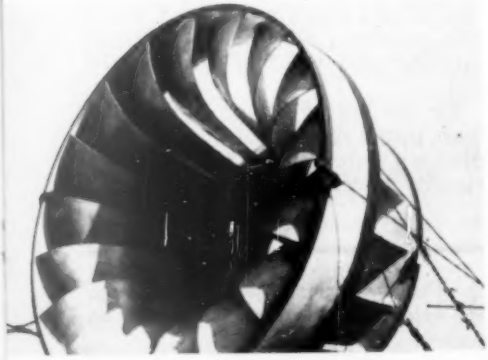
When turbine blades used in hydroelectric plants are eaten away by pitting or cavitation, solution is welding in stainless steel inserts. It's an easy job if you follow the step-by-step instructions given here.

by **LLOYD McWILLIAMS,**
Maint. Supervisor,
Shawinigan Water & Power Co.,
Shawinigan Falls, Quebec, Canada

NUMEROUS articles have appeared on the subject of repairing pitted runners by welding, in the hydro-electric field. Since the welding repair job discussed here was somewhat unusual, a brief description of the way it was handled may prove of interest.

This job involved rebuilding and bringing back to original contour, the runner blades or buckets on a 45,000 horsepower turbine at Shawinigan Falls, Quebec.

Arc welding will be used to repair pitted areas in blades of this typical 65,000 horsepower turbine runner.

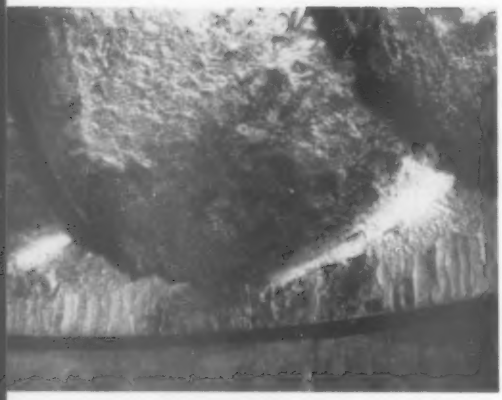


For those not familiar with cavitation and pitting on runners a word is perhaps in order on this, at times, almost maddening problem: Pitting is sometimes erroneously called cavitation. The word cavitation might well have been used since erosion of runner buckets, in many respects, resembles the failure which we humans experience with our teeth. But engineering bodies who set up the standard terms we use have now agreed that the term cavitation be considered as the *action* causing pitting, and that the actual pitting be the effect or result of this action.

The maintenance and repair man, while interested in the theory of cavitation and pitting, is chiefly concerned with developing methods of stopping it once it has started.

Stainless Steel Overlay

Normal practice is to repair, by welding an overlay of stainless steel over pitted areas as soon as it appears that buckets are being attacked. This is evidenced by formation of a rough etched-like surface which in time develops a spongy appearance, usually at the back, of the trailing or discharge side. If allowed to continue, as it was in this case, the discharge



1 Pitting has reached an advanced stage. Metal at trailing edge of buckets is completely eaten away.

2 These are not orange peels, but bucket sections which have been cut out before repairs are started.

edge of buckets become completely eaten away. This of course results in a loss of water and poor efficiency.

During emergencies, due to great demands for power, it was necessary to allow runners on large units to deteriorate beyond the stage that good maintenance would normally permit. The unit under discussion was in this category. Bucket trailing edges had been completely eaten away by the action of cavitation, so that there was no metal left on which to start a "refill" job by welding.

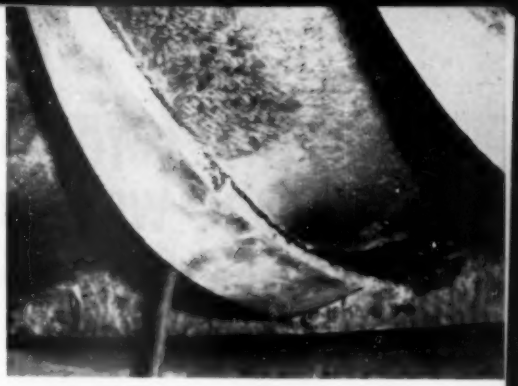
Some thought was given to ordering a new runner. Delivery date was over a year. Consideration was given to dismantling the unit and shipping the runner to its makers for repair. This would have run into several thousands of dollars plus "down" time. Water storages at the time were full, a point that operation considers very carefully before releasing a large unit for repairs.

Work at "Off-Peak" Period

The method finally agreed upon was as follows: Each weekend during the "off-peak" period, the tailrace elevation was lowered. This allowed entry into the draft-tube through a manhole below the runner which normally is below water level. A platform was constructed which could be easily installed and quickly removed. From this platform all work of cutting, burning and welding was carried out.

On the first weekend, two of the least pitted sections of buckets (see photos) were cut out from diametrically opposite sides of the runner.

3 These stainless steel sections are welded into cut-out sections on buckets.



4 Inserts are tack welded into place. They are cast with chamfered edges to facilitate welding.

This was to eliminate the possibility of unbalance, since the machine, after clearing out the platform, was put back on the bus each Sunday night.

From the cut-out sections patterns were made to conform to the undamaged original section as closely as possible. Stainless steel inserts were cast to these patterns and provided with a chamfered edge to facilitate welding. The alloy used was #316-KAMO. The rod used to weld in the inserts was #D-501 A.I.S.I.

Weld Cast Inserts

The following weekend, it was learned that four men could cut out two additional sections and weld into place two of the cast inserts. Five weekends finished the welding phase of the job—without loss of a single kwhr on the unit. There was, of course, some time spent in grinding.

From an economical point of view, this repair proved less costly than some of the "fill-in" jobs done on similar units.

Actually, this is not the ideal way to make runner repairs, although this job has proved most satisfactory to date. When runners can be taken out and turned over, this is by far the most practical method. It is much easier for workmen to deposit a good bead with the work hanging from a crane so that it can be positioned.

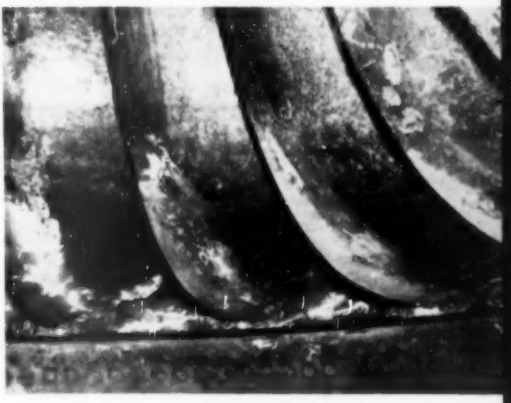
Consider Inert Arc Welding

Semi-automatic inert-arc welding seems to offer possibilities on the repair of runners. However, there are still a number of difficulties to overcome. One particularly, is that the 'gun' now used is

(Continued on Page 69)

5 Welding job has been completed. Care in fit-up and welding keeps excess weld metal to a minimum.

6 Finished job is shown after grinding. Note how smoothly inserts conform to original contour of runner buckets.



21 WAYS TO LOWER COST OF ARC WELDING FOR PRODUCTION

by ROBERT WILSON

In the last of three important articles, the author, who is Welding Applications Engineer at Lincoln Electric Co., explains how welding procedures can save time and materials. He discusses in detail selection of use of electrodes and welding machines.

WELDING procedures are the concern of both the designer and the welding supervisor. Correct procedures can save both time and material.

16. Correct Electrode Size

The selection of correct electrode size can reduce the amount of deposited metal in the joint and increase the rate of deposition. These desirable objectives are accomplished by increasing penetration and decreasing arc time.

Increased penetration and decreased arc time can be accomplished at the same time by taking full advantage of the natural force of the welding arc. The effectiveness of the arc force is a product of the amount of welding current and travel speed of the arc. An increase in current increases the arc force and penetration just as an increase in the volume of water through the same size nozzle increases the digging power of a stream of water.

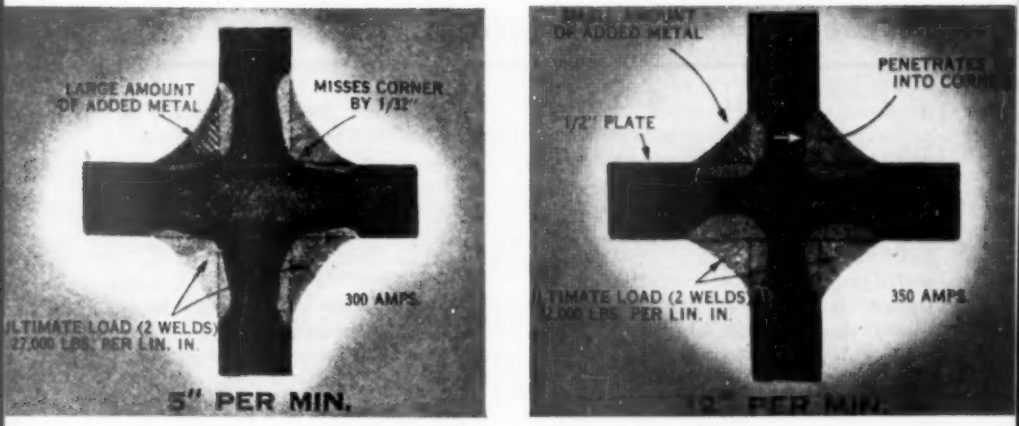
The increased arc force will be most effective however, if the arc speed is fast enough to prevent a molten pool of metal from getting under the arc and absorbing the force of the arc. The arc must be directed against the base metal. This is done by keeping the tip of the electrode ahead of the molten pool at all times. This gives the arc force full opportunity to dig deep into the root of the joint.

In general, the larger the electrode, the lower the cost of the joint. Increasing the size of the electrode will decrease arc time and increase penetration. The rate of deposition is proportional to the current used. Metal cannot be deposited any faster than it can be melted off the end of the electrode. Increasing the current will increase the melt-off rate and permit faster welding speeds. The in-

Relative Cost of Depositing One Pound of Weld Metal with Different Size Electrodes

Size—inches	1/2	5/32	3/16	1/4	5/16	Submerged Arc Welding
Amperes	110	130	160	250	350	800
Cost lb.—deposited metal	$4.50	$3.60	$3.00	$1.60	$1.20	.50
Cost/50 lb. box deposited	150	120	100	55	40	less than $25

Figured on the basis of 30% loss through spatter stub end and coating loss.—200% overhead—2c /KWH—$1.25/hr. labor—50% operating factor.


LARGE AMOUNT OF ADDED METAL
MISSES CORNER BY 1/32"
300 AMPS.
ULTIMATE LOAD (2 WELDS) 27,000 LBS. PER LIN. IN.
5" PER MIN.
OF ADDED METAL
PENETRATES INTO CORN
1/2" PLATE
350 AMPS.
ULTIMATE LOAD (2 WELDS) 2,000 LBS. PER LIN. IN.

Larger electrodes and deeper penetration of "arc force technique" of welding (right) reduces cross sectional area of weld metal by 50 percent and requires 59 percent less man hours.

creased current and speed also produce greater penetration, yielding a joint consisting of more fused plate metal and less deposited metal.

For example, with larger electrodes and deeper penetration into the corner of a fillet weld, the arc force technique of welding reduces the cross sectional area of the deposited metal by 50 percent, requiring 59 per cent less man-hours to make the weld.

In a butt weld, the arc force technique allows changing from a V-butt joint in ⅜-inch plate to a plain square edge joint, cutting the amount of weld metal deposited by 50 percent. This in turn reduces man-hours by 78 percent.

The skill of the operator plus the surface appearance requirements of the job generally limit the amount of current that can be used on a given plate thickness with a given electrode.

17. Electrode Type

Certain variations in operating characteristics of different electrodes will make a difference in the effectiveness of the arc force technique in securing greater penetration and greater speeds. Two ¼-inch electrodes of similar design but different makes can produce varying results under similar conditions.

Cost of operating the electrode may be influenced by slag covering characteristics which may slow welding speeds. Slag loss, slag removal, spatter loss, deposition efficiency and melting rate will also be important.

The type and make of electrode should be selected on its ability to make the most weld of a given strength in a given time. Depending on type of joint and design, this electrode may be the best penetrating electrode or again it may be the electrode with the fastest melt-off rate.

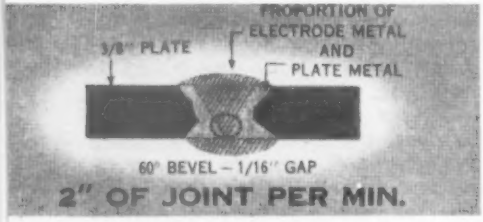
18. Polarity

Better operating conditions may be obtained with one polarity over

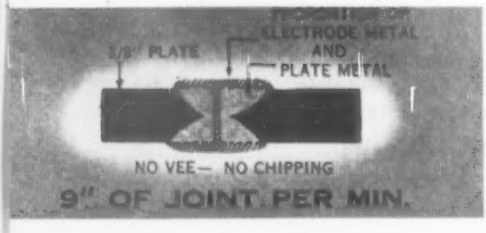
another. With electrode negative polarity, more heat is concentrated at the tip of the electrode and more electrode is usually melted off per minute than with electrode positive polarity. Also, greater penetration results. With electrode positive and work negative, base metal or work is hotter than the electrode.

19. Arc Length

For most efficient welding position, the shortest possible arc should be used. Wherever possible, tip of the electrode coating should be kept in contact lightly with the plate, dragging the electrode along the joint. This prevents the heat and force of the arc from being dissipated into the surrounding air and increases the effectiveness of the arc force.



"Arc force technique" allows changing from V-butt joint (above) to plain square edge joint (below). Weld metal deposited is reduced by 50 percent and man-hours reduced by 78 per cent.



A short arc also reduces the arc voltage and increases the welding amperage. Higher amperage can be secured without changing the setting of the machine simply by shortening the arc.

20. Stub End Length

The control of the length of the stub end of electrode which is not used is an effective means of cost reduction. This is a responsibility of both the operator and management.

Labor cost per pound of deposited metal increases with increased stub end losses due to greater number of interruptions and lower operating factor. Material costs of pounds of electrode per pound of deposited metal increase due to stub end waste. On the average, labor costs increase 3 percent for each two inches above the standard 2-inch stub end loss. For a 14-inch electrode with a 2-inch stub loss, 1.6 pounds are required to deposit a pound of metal. With an 8-inch stub loss the average requirement is 3.2 pounds of electrode for a deposited pound of metal.

21. Machine Efficiency

A welding machine should be used which operates at maximum efficiency under the conditions existing with the majority of welding jobs to be done. Trying to use more efficient higher currents with a too small welder, may offset cost reductions realized in the welding. If the proper size machine is used, this will not be true as higher currents result in higher generator efficiencies. Also, some machines, both AC and DC, have special features to permit more precise control of welding arc to produce desired characteristics.

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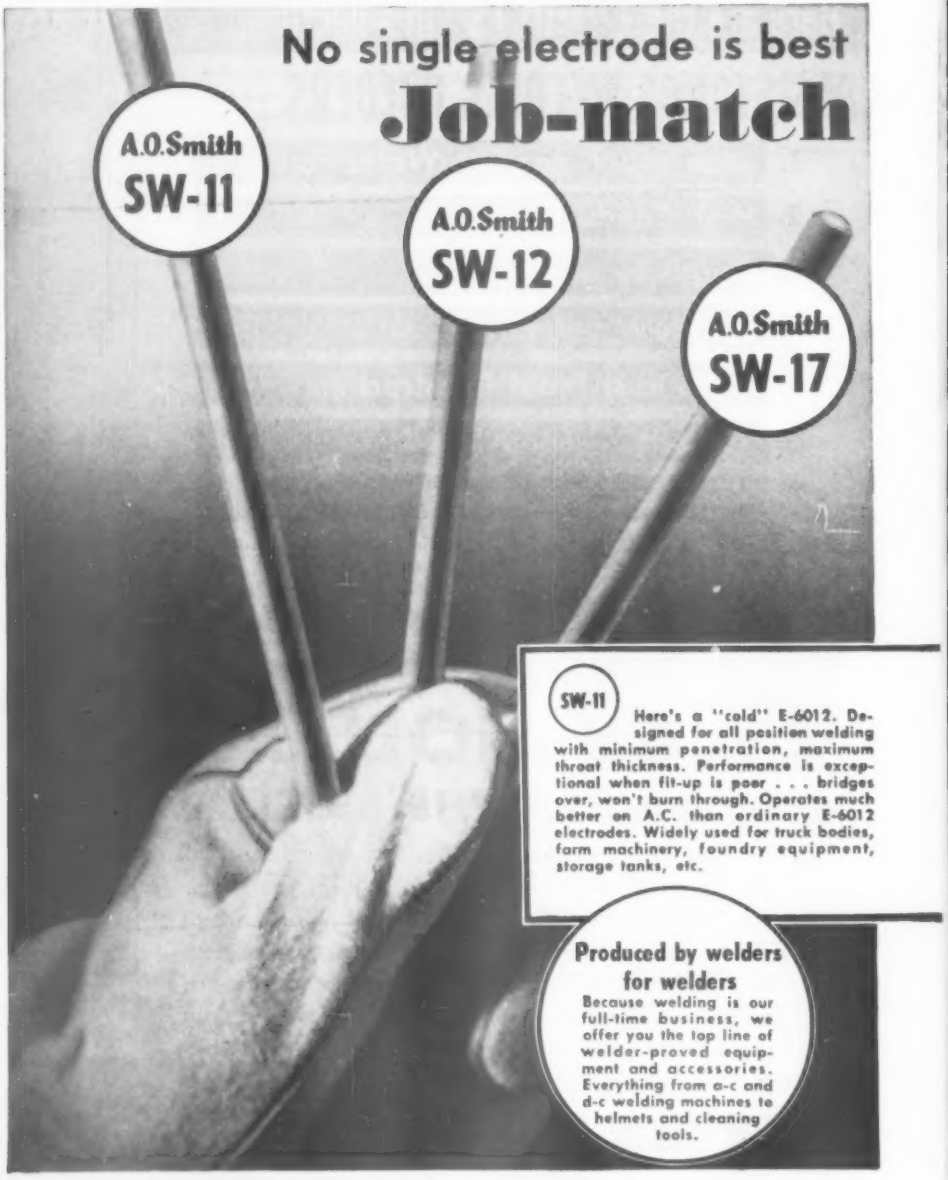
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Welding of copper-base alloys presents few difficulties that cannot be overcome. All that is required is proper welding techniques, correct joint preparation and an understanding of metallurgical changes that take place when welding a specific alloy. Here's the story on . . . . .

CARBON ARC WELDING OF COPPER

• The third in a series, this article will be followed by others on fabrication of copper-base alloys by the various arc welding and resistance welding processes.

THE carbon arc has much of the flexibility of the oxy-acetylene welding process and has the additional advantage of a higher rate of heat input and consequently higher welding speeds. As mentioned previously, high welding speeds are essential, especially in the joining of copper base alloys that are characteristically 'hot short'. Important factors in carbon arc welding include absolute cleanliness of material prior to the application of the welding heat, use of standard joint designs and use of suitable back-up bars to assure the production of smooth and sound welds.

Pointed carbons, ranging from $\frac{3}{32}$ to $\frac{1}{2}$ inches in diameter, are used; a general rule is that the largest carbon (10) that can be kept to a sharp point at a specific value of current should be used. In addition, the carbon electrode should be gripped about 3 inches from the arc for normal usage. Straight polarity (carbon negative) should always be employed. Otherwise, a black, sooty smudge will cover the work and the joint will not fuse properly. In actual practice, arc is concentrated on the filler rod instead of the parent metal. The material to be welded is invariably pre-heated to almost the welding temperature prior to the start of actual welding.

The length of arc varies with the material to be welded. In the

welding of copper, a medium to long arc is employed. In welding of silicon bronzes or other alloys where a silicon bronze filler rod is employed, a short arc is employed. The short arc gives greater heat concentration, minimizing oxidation of the parent metal which would hinder good flowing of the deposited metal.

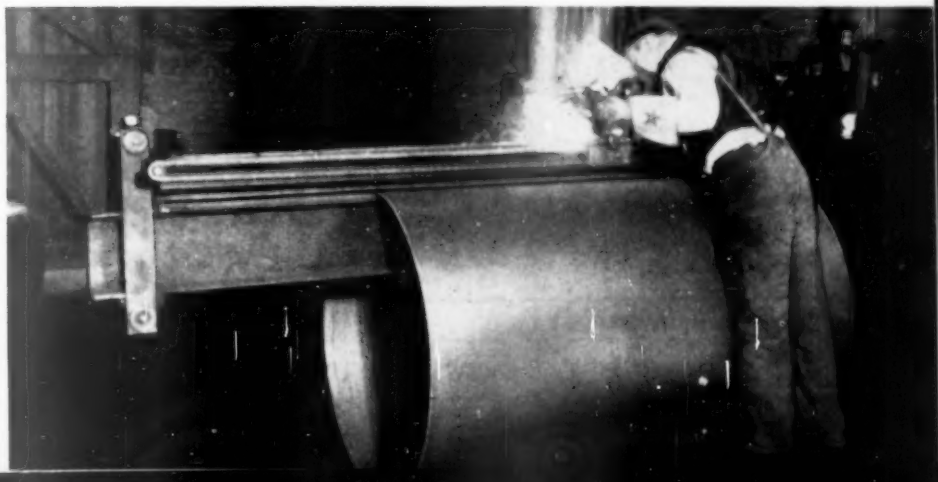
Use Phosphor-Bronze Rods

As previously mentioned, electrolytic tough-pitch copper is difficult to weld due to the loss of joint strength caused by segregation of the cuprous oxide phase. Where slight reductions in weld strength are not too objectionable, the carbon arc method of welding can be employed if welding speeds from 10 to 20 ipm can be obtained. This high welding speed can be attained by the use of the fluid phosphor bronze welding rods. The 8 and 10 percent tin content rods (E Cu Sn-C and E CuSn-D) being used on thicknesses up to ⅜ inches. Welding above this stated thickness is not usually considered practical. The carbon rod should be at least equal to the size of the welding rod and preferably larger. No flux is employed and the use of multi-pass welding technique is not usually advisable.

As can be expected, the weldability of deoxidized copper is a good deal better than the oxygen bearing copper. The speed of welding is not as critical. The copper silicon electrode (E Cu Si) along with a suitable fluxing agent has been used with success. This combination permits multi-pass welding and permits joining of deoxidized copper in all thicknesses. Where the phosphor bronze electrode (E Cu Sn-A) is employed, multipass welding is not usually recommended. Maximum plate thickness welded is ⅜-inch. Downhand welding should be employed and the use of a backing plate is highly recommended.

In joining the silicon bronze alloys, the filler rod composition is very similar to the base metal. Due to the presence of a strong deoxidizer in the silicon bronzes, or when using silicon bronze filler rod in the welding of other alloys, a short arc length, about ¼inch, is required. The size of both the carbon electrodes and the welding rod along with the welding current is dependent upon the thickness of plate. Carbon arc welding of the

Automatic carbon arc welding fabricates longitudinal seam in silicon-bronze tank.



silicon bronze can be done in all thicknesses and, when required, multi-pass welding procedures are employed. Weld deposits must be cleaned thoroughly before placement of succeeding beads.

To prevent cracking on multi-pass welding (due to the 'hot short' characteristics of these alloys) the second and succeeding passes must never be started from the end of the joint. The start should be made several inches in from one end and the weld carried out to both ends from that point. The first pass in multi-pass welding is done with a smaller weld rod and lower current input than that used for succeeding passes. A thin wash consisting of 90 percent fused borax

TABLE I—Suggested procedure for carbon arc welding copper-silicon alloys.

Metal Thickness, Inches	Number of Beads	Welding Rod Diameter, Inches	Carbon Diameter, Inches	Welding Current*	Remarks
3/16	1	1/8	1/4	100	Welding Speed 15 in/min.
3/32	1	5/32	1/4	125	Welding Speed 15 in./min.
1/8	1	5/32	5/16	140	Welding Speed 15 in./min.
5/32	1	3/16	5/16	200	Welding Speed 15 in./min.
3/16	1 2	1/4 5/32	3/8 5/16	225 150	Welding Speed 12 in./min.
Double 1/4 Vee	1 3 2 3	1/8 3/16 3/16	5/16 5/16 5/16	150 200 200	45 degrees Bevel
Single 1/4 Vee	1 3 2 3	1/8 5/32 3/16	5/16 5/16 3/8	150 180 220	45 degrees Bevel
Double 3/8 Vee	1 4 2 3, 4	5/32 5/32 1/4	5/16 5/16 3/8	150 180 250	45 degrees Bevel
Single 3/8 Vee	1 2 4 3 4	1/8 5/32 3/16 1/4	5/16 5/16 3/8 3/8	150 180 220 275	30 degrees Bevel
Double 1/2 Vee	1 2 6 3, 4 5, 6	5/32 5/32 3/16 1/4	5/16 5/16 3/8 3/8	150 180 225 300	45 degrees Bevel
Single 1/2 Vee	1 2 5 3 4, 5	5/32 5/32 3/16 1/4	5/16 5/16 3/8 3/8	150 200 230 300	30 degrees Bevel

*Short Arc 15 to 20 Volts

TABLE II
Filler rod diameters and current values for carbon arc welding of copper.

Thickness of Copper		Carbon Size, Inches	Filler Rod Diameter, Inches	Welding Current, Amperes
U. S. Gage	Inches			
18	1/20	3/16	3/32	120—160
17	6/160	3/16	3/32	130—180
16	1/16	3/16	1/8	140—190
15	9/128	3/16	1/8	150—200
14	5/64	1/4	5/32	195—260
13	3/32	1/4	5/32	200—270
12	7/64	1/4	5/32	210—280
11	1/8	1/4	3/16	225—300
9	5/32	1/4	3/16	250—330
7	3/16	1/4	3/16	280—370
5	7/32	5/16	1/4	300—400
3	1/4	5/16	1/4	315—430
	5/16	5/16	5/16	340—450
	3/8	5/16	5/16	370—470
	7/16	3/8	3/8	400—500
	1/2	3/8	3/8	420—550

and 10 percent sodium fluoride mixed with water free alcohol is recommended. This flux is applied to both base metal and filler rod. In multi-pass welding, a dry flux can be used for the second and succeeding passes. Graphitic electrodes are usually recommended.

Pre-heating prior to welding will facilitate welding. A minimum of 250°F is usually sufficient to assure complete elimination of water vapor which may be in the flux. It should be remembered that due to the hot short characteristics of the silicon bronze alloys, excessive heat may cause weld cracking. Another difficulty is the possibility of crater cracks. This is due to the shrinkage of the metal induced by high heats when the arc is broken. This means that welding should be done with as few starts and stops as possible.

The copper-silicon rods (E Cu Si) is also employed in the carbon-arc welding of the copper-zinc alloys such as commercial bronze, red brass, yellow brass and muntz metal. Fuming will occur. However, this can be minimized by maintaining the arc on the filler rod and the use of pre-heat to allow the use of reduced current. The phosphor bronze electrodes (E Cu Sn-C and E Cu Sn-D) can be employed in the joining of the low brasses. They are limited, however, to single pass welding procedure. In either case, a pre-heat, not in excess of 400°F., will be required to obtain a satisfactory weld joint. A flux is employed and applied in welding the silicon

TABLE III
Suggested data for automatic welding of silicon bronze alloy.

Thickness	Amperes	Volts	Carbon Size	Filler Size	Filler Speed	Speed, In./Min.
1/16"	130	24	1/4"	3/32"	30	24
3/32"	150	24	1/4"	3/32"	30	20
1/8"	170	25	1/4"	1/8"	24	18
5/32"	200	25	1/4"	1/8"	22	16
3/16"	225	25	1/4"	1/8"	20	14

bronze alloys. The composition of this flux varies with the welding rod type employed. In the welding of brass compositions that contain more than 15 percent zinc, a stress relief helps avoid failures due to stress corrosion.

The carbon arc procedure is used quite extensively in the welding of the aluminum bronze alloys. Use of covered electrodes of similar composition as the base metal is essential, since the very refractory aluminum oxides which may form during welding must be fluxed and subsequently removed.

A fairly high pre-heat temperature of 700 to 800°F is recommended for the high aluminum grades (Rockwell 90B and over). The low aluminum grades in heavy sections require both pre-heat and inter-pass temperatures of about 400°F. This practice will insure the avoidance of possible weld cracking. In addition, the high aluminum grades require a post heating to around 1150°F, followed by rapid cooling. All welding should be done in a flat position. A weaving motion distributes the intense heat of the arc.

Due to the fact that the beryllium copper alloys also have a refractory oxide very similar to the aluminum bronze alloys, coated electrodes of similar base analysis are employed. Electrodes having nickel as the secondary alloy are preferred to those having cobalt since maximum mechanical properties can be realized after the structure has been submitted to a heat treatment. In the welding of this type of material, both pre-heat and inter-pass temperatures of from 600 to 700°F are required to obtain a smooth weld deposition and to prevent undercutting. The mechanical properties of these alloys can be increased by the use of a suitable heat treatment.

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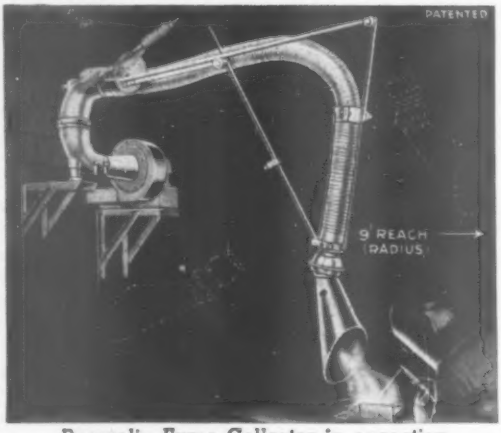

Ruemelin Fume Collector in operation.

Welding shops equipped with Ruemelin Fume Collectors are assured of a clean shop atmosphere. Noxious fumes, heat and smoke are eliminated AT THEIR SOURCE. Improves working conditions . . . lessens fatigue . . . paves the way for increased plant production. Especially helpful in winter months when windows and doors are closed. Note the new spring-loaded counterbalance mechanism which makes Fume Collectors much easier to handle. Ask for Bulletin 37-E illustrating this new feature.

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The carbon arc method of welding can also be employed in the joining of the phosphor bronze alloys. However, this process is not the preferred method. Bare phosphor bronze rods are employed and it is essential to spread the heat of the arc so that a minimum amount of the phosphor deoxidizer vaporizes. Usually the combination of a concentrated arc, short arc and high current values will result in an oxidized and unsound weld deposit.

The carbon arc welding of any copper base alloy that is leaded for free machinability will cause difficulties because of 'lead sweating'.

Carbon Electrode Diameter, Inches	Welding Rod Diameter, Inches	Current, Amperes
3/16	3/32, 1/8, 5/32	60 to 80
1/4	5/32, 3/16	80 to 130
3/8	3/16, 1/4	130 to 250
1/2	1/4, 5/16	250 to 350
3/4	5/16, 3/8	350 to 500
1	3/8, 1/2	500 to 700

TABLE IV—Suggested values for carbon arc welding of aluminum-bronze alloys.

The automatic carbon arc process is used extensively in the welding of copper and its alloys. Deoxidized copper electrode material (E Cu) is used for copper welding. Either the silicon bronze (E Cu Si) or the phosphor bronze electrodes are employed in the welding of copper alloys such as silicon bronze, due to free flowing characteristics. As in manual welding, pre-heating of sections that are ¼-inch or heavier in thickness is required in the event that copper is being welded. Welding is done without the use of a fluxing agent. In the welding of an alloy, such as the silicon bronzes, cleanliness of joint is essential. Use of the previously mentioned fused borax and sodium fluoride flux mixture in alcohol is required.

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STAINLESS WIRE AND ARCOSITE FLUX

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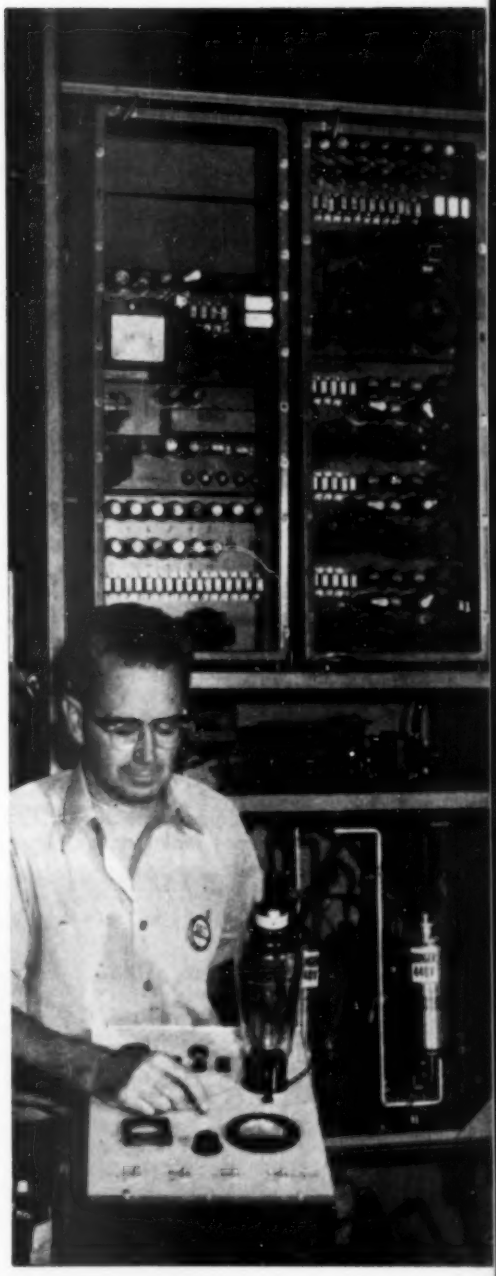
Tube Tester Cuts Resistance Welding Maintenance Time

ELECTRICAL maintenance men at Ryan Aeronautical Co. are saving time and trouble with a new tube tester which takes the guesswork out of trouble-shooting. This device is used to test the large Thyratron electronic tubes which are used in all resistance welding machines. At Ryan, where 100 welding machines of this type are in constant use, the tube tester is a valuable tool for pin-pointing tube troubles and keeping machine "down-time" to a minimum.

The instrument was designed by electrical maintenance personnel and fabricated from used, surplus materials. It contains relatively few parts including a transformer, grid circuit, resistors, voltage regulator tube, rectifier, ammeter and voltmeter. The ammeter has been modified to register from zero to 5 amperes. The voltmeter has been altered to register from minus 20 to plus 20 volts.

With the new device, Ryan electricians can check the eight types of Thyratron tubes used in welding equipment in the plant, including the 677, 672A, FG17, FG95 and FG57 types. Within a few minutes,



ABOUT THE PHOTO

Electronic tube is checked in new Ryan tube tester. "Trigger" tube controls large amounts of electricity used in resistance welding machines.

Tester salvages tubes worth $8 to $55 . . .

the tester will positively indicate the control characteristics of a tube.

Thyratron tubes are the largest and most expensive types used in welding machine control panels. They cost between $8 and $55, depending upon their size and type. Called "trigger tubes" by electricians, they are actually electronic switches which control the large amounts of electricity needed to weld metals. With these tubes, it is possible to control large voltages, say 3000 volts, with small voltages of only 5 or 10 volts, within accurate limits.

Which Tubes Were Good?

Because tube testers are not available, commercially, for testing these large, specialized tubes, Ryan electricians have had to check them by trial and error methods in the past. A suspected tube in a welding machine was replaced with a new one. If the machine then worked properly, it was assumed that the removed tube was malfunctioning. But it was not thrown away because it might work well in another machine where voltages were slightly different. And, these tubes are so expensive that it was inadvisable to throw them out because they failed to operate in a particular machine. Therefore, they were accumulated in a storage supply which contained tubes that were either no good or capable of being used in certain machines and not in others.

If the welding machine failed to operate correctly when the Thyratron tube was replaced, then the maintenance man was faced with the question of whether the new tube was good, whether the trouble was elsewhere, or whether both the tube and some other defect were causing the machine's behavior.

How Thyratrons Work

Like most electronic tubes, Thyratrons consist of a cathode "gun"

(Turn to Page 68)

Simplicity and compactness of new tube tester is demonstrated by George Pearson, of Ryan electrical maintenance, who helped design and build the special unit.

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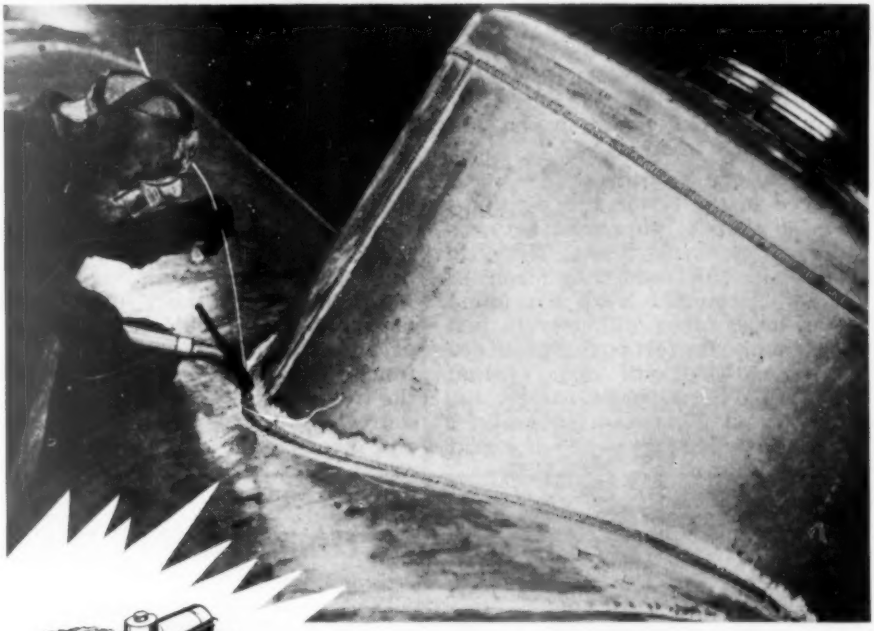

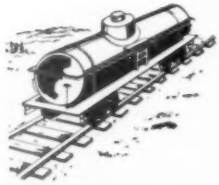

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ALUMINUM RODS AND ELECTRODES

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which fires a stream of electrons at a target plate. Between the cathode and plate, a grid is interposed and charged with electricity. By impressing the proper voltage on this grid, it is possible to repel the flow of electrons to prevent them from reaching the plate. In this way, a sensitive switch is obtained which allows the current to flow under one condition and cuts it off under another.

To test a Thyratron tube, it is placed in the tester and a voltage of 600 volts is impressed between the cathode and plate. The grid voltage is then varied by means of a potentiometer. Ryan has found that these tubes will operate just as reliably, for test purposes, on 600 volts as they will under actual operating conditions of 2000 volts. Almost all Thyratron tubes used at Ryan will "fire" when the grid voltage is varied between zero and 6 volts. With the tester, it is possible to see exactly where the tube cuts in and off and the voltage at which the tube will "fire" the currents required by the welding machine.

Tester Classifies Tubes

Using the new tester, Ryan electricians have thrown out many Thyratron tubes which were held in storage because of their doubtful quality. Others have been rated so that they may be used in certain machines where conditions are suitable for their operation. Most important, the tube tester permits the immediate qualification of questionable Thyratrons in malfunctioning machines and allows the trouble-shooter to rule out that source of trouble with certainty and dispatch.

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WELDING "CURES" A SICK TURBINE

(Continued from Page 51)

much too long to allow entry between the buckets. Another drawback is that the work must be extremely clean, calling for an undue amount of chipping, grinding, etc., before one can establish an arc. The designer who comes out with a truly satisfactory welding unit, that will handle vertical and overhead work with all the space limitations and awkward positions met with on runners, will be deserving of an award from men in the hydro field.

Barnett to Head Armour Research Foundation's First Annual Midwest Welding Conference

Orville T. Barnett, supervisor of welding research at Armour Research Foundation of Illinois Institute of Technology, Chicago, is in charge of arrangements for the first annual Midwest Welding Conference to be held Feb. 8 and 9 at the research foundation. The topics of discussion at the conference will be the latest research findings in welding and unique applications of welding processes. According to Barnett, about 75% of the program will be devoted to reports on actual applications of welding processes and the remaining 25% of the program will be devoted to the latest research findings in the welding field.

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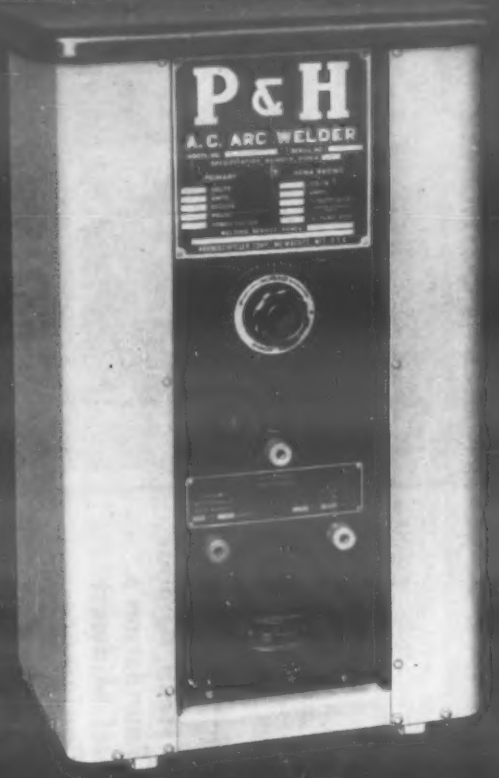

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Wide Range — You can go from 25 amps to 295 amps. You can use this machine on light-gauge material, as well as on heavy plate.

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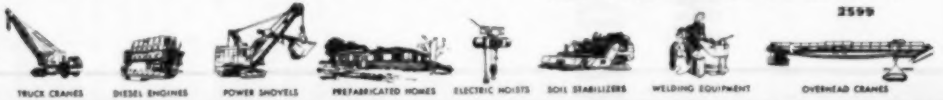

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HOW TO USE AND CARE FOR GRINDING WHEELS

by BOYD H. WORK

Author Boyd H. Work is staff assistant to the vice president, Bonded Products and Grain Division, Carborundum Company.

THERE'S an American Standard Safety Code: "The Use, Care and Protection of Abrasive Wheels". It's chiefly the product of three sources:

grinding wheel manufacturers, grinding machine tool builders and user groups—meaning industrial consumers, insurance underwriters, state and national safety commissions, safety engineers, labor organizations, and the like.

Manufacturers' Responsibilities

The manufacturer first: It is his responsibility to produce abrasive wheels with the greatest possible strength, to test for reasonable safety factors, to provide for greater efficiency under proper operation. He must package his wheels so that they reach the consumer's plant in good condition.

The grinding machine tool builder second: His problem is to design equipment that will operate successfully within safe speed limits. He must supply protective devices such as goods and guards which will contribute to the safe operation of the wheels.

What User Should Do

Finally the user: As soon as abrasive wheels are delivered to him, he should examine them carefully to be sure no damage has been done to them in transit. His storage and handling methods must conform to safety code standards. He must see that the grinding machine tool builder's recommendations are followed, and that all safety devices are in place and working.

What's more, the user must make sure that grinding machine speeds tally with the speeds shown on the wheels. He must teach workers to use all safety devices correctly and constantly, and must familiarize them with the limits of the wheels with which they work.

The code of the American Standards Association, the catalogs of

abrasive wheel manufacturers, and the safety codes of some states provide basic data on safety practices and proper uses of grinding wheels.

Any grinding wheel is made up of specific types and sizes of abrasive grains, which are held in a bonding material. Strength of the wheel is determined by the relationship between its size and shape, and by the amount of cohesion set up by its grain-bond space relationship.

(This grain-bond space relationship, of course, is in its turn determined by three factors: the type and size of the abrasive, the kind of bonding material, and the space allowed between grains).

Three Wheel Strengths

Grinding wheels are manufactured in three strengths: high, medium, low. Strength must vary in accordance with working stresses if the best grinding results are to be reached. Also, wheels must vary in size and shape to do different kinds of grinding.

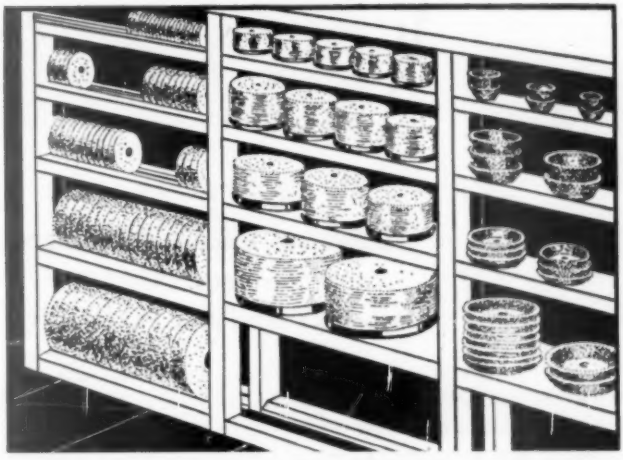
A change in any of the factors mentioned — size, shape, grain, bond, space between grains — means a change in the strength of the wheel.

As an obvious example, a wheel with a small hole is stronger than a wheel with a large hole, assuming that otherwise the two wheels are alike.

Thick and thin wheels may show the same general strength. They may show no great difference in bursting speed. Yet, under side working pressures—forces applied parallel to the wheel rather than perpendicularly or radially — the thick wheel will be the stronger and safer of the two.

Other changes, less apparent, can be made in strength by changing the type or size of the grain, the type of the bonding material, or the basic structure of the wheel. A fine grit usually makes a stronger wheel than a coarse grit, if other factors are equal. A dense structure is usually stronger than an open one. One bonding material will be stronger than another.

Considering only minimum rather than maximum possibilities, grinding wheel manufacture involves these factors:



Storage room safety helps prevent wheel breakage at the machine. Wheels should be stored in racks under the supervision of one who has been trained in the care and handling of abrasive wheels.

Exercise care in handling and storing wheels . . .

• Two basic grain types—silicon carbide and fused aluminum oxide.

• About 20 different grain sizes.

• About the same number of grades (hard to soft; strong to weak).

• Three different wheel structures.

• Five kinds of bonding materials—ceramic or vitrified, resinoid (synthetic resins), rubber, shellac and silicate.

If all these were made in all possible combinations — which is not the case — there would be 12,000 distinctly different abrasive articles, without regard to any variations in wheel size and shape. Every combination of these articles would have different strength characteristics in relation to the operating stresses involved in any particular grinding operation.

Only the grinding wheel manufacturer can be really familiar with all these various factors and relationships.

This points, of course, to the need for close cooperation among the wheel manufacturer, the grinding machine tool builder, and the machine tool user. Maximum safety in actual work with the grinding wheel can be attained solely by such cooperation.

Strength Can Create Hazards

However, it is not enough to consider strength characteristics without relating them to the operating stresses and other conditions which surround the grinding operation. Curiously, added strength, under certain conditions, may create an

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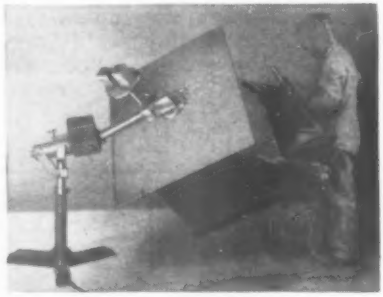

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additional hazard rather than correct a hazard.

A few examples will show more clearly the relationship between operation and the abrasive product used in any wheel, and will point out what can happen to induce unsafe working conditions.

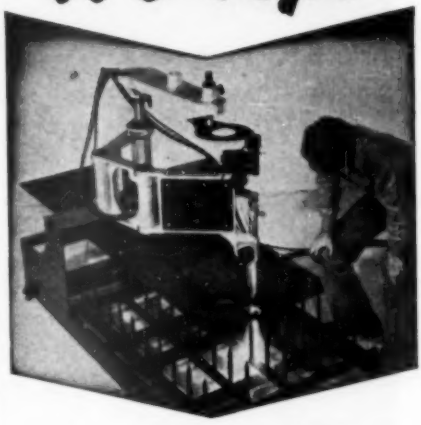
For any grinding job, a wheel is chosen of a size and shape suitable to the machine on which it will be used. Grit size, structure and bonding material are combined to do the work with the greatest possible safety and efficiency.

When hole size permits, slip a finger through the center of a newly delivered grinding wheel. Tap it gently with some light instrument or (for very large wheels) a wooden mallet. If a clear ring is not produced, wheel should be examined for cracks.

Wheel breakage which occurs at speeds higher than those recommended carries with it an extra hazard: impacts of broken particles on protective hoods may go beyond the limits of these devices to contain the thrown-off fragments.

In January the author discusses preventive action that can be taken to insure safe operation of grinding wheels.

It's Tops



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A: Contact your nearest Alcoa sales office, or, for immediate delivery, call one of the Alcoa Distributors listed below. He carries a complete range of alloys and sizes, and you'll find him well qualified to work with your welding experts.

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Steel Sales Co. of Mich.

HARRISON, N. J.
Whitehead Metal Products Co., Inc.

HOUSTON, TEXAS
Metal Goods Corp.

INDIANAPOLIS, IND.
Steel Sales Co. of Indiana, Inc.

JACKSONVILLE, FLA.
Florida Metals, Inc.

KANSAS CITY, NORTH, MO.
†Marsh Steel Corp.
Metal Goods Corp.

LOS ANGELES, CALIF.
†Ducommun Metals & Supply Co.
Pacific Metals Co., Ltd.

LOUISVILLE, KY.
Williams & Co., Inc.

MIAMI, FLA.
Florida Metals, Inc.

MILFORD, CONN.
†Edgcomb Steel of New England, Inc.

MILWAUKEE, WIS.
Central Steel & Wire Co.
Steel Sales Co. of Wis.

MINNEAPOLIS, MINN.
Steel Sales Co. of Minnesota

NASHUA, N. H.
Edgcomb Steel of New England, Inc.

NEW ORLEANS, LA.
Metal Goods Corp.

NEW YORK, N. Y.
†Whitehead Metal Products Co., Inc.

PHILADELPHIA, PA.
†Edgcomb Steel Co.
Whitehead Metal Products Co., Inc.

PITTSBURGH, PA.
†Williams & Co., Inc.

PORTLAND, ORE.
†Pacific Metal Co.

ROCHESTER, N. Y.
Brace-Mueller-Huntley, Inc.

ST. LOUIS, MO.
†Metal Goods Corp.

SALT LAKE CITY, UTAH
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SAN DIEGO, CALIF.
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Pacific Metal Co.

SYRACUSE, N. Y.
†Brace-Mueller-Huntley, Inc.
Whitehead Metal Products Co., Inc.

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†Florida Metals, Inc.

TOLEDO, OHIO
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SOUNDLY DESIGNED—Dockson Torches were developed by welding and cutting specialists to handle your needs—quickly, easily, and economically.

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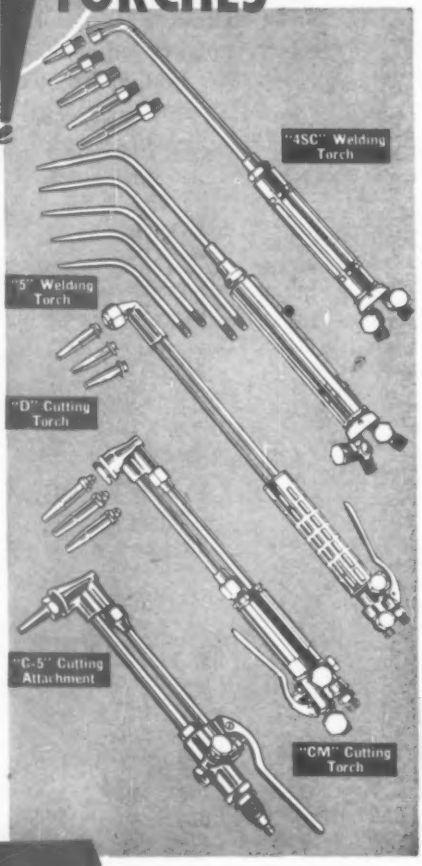
YOUR DOCKSON DISTRIBUTOR—a selected specialist, stocks a complete line of Dockson products to give you fast service and personal attention. We back our distributors 100%.



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WRITE FOR YOUR DISTRIBUTOR'S NAME AND OUR COMPLETE CATALOG OF WELDING AND CUTTING EQUIPMENT.

Circle No. 44 on Reader Service Card.

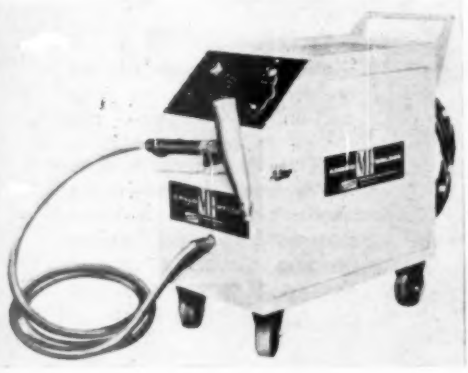
An **INDUSTRY & WELDING** Report . . .

Semi-Automatic Magnetic Flux Welder Speeds Fabrication of Mild Steel

A NEW, semi-automatic welding machine developed by the Amsco Division of American Brake Shoe Co. is said to be the first machine to combine the advantages of manual and automatic welding, while eliminating most disadvantages encountered with either method.

Called the MF welder, the new machine feeds bare wire through a hand-held hopper containing magnetic flux. Flux clings to the wire as it leaves the hopper because of the magnetic field set up by the welding current flowing through the wire. Thus the electrode wire, which is fed continuous from a coil, reaches the arc with a flux covering that contributes the advantages of a manual electrode coating. Operator can weld steadily for 15 minutes if desired; delay of replacing electrodes and waste of stub ends are said to be eliminated.

Magnetic flux welder is said to combine advantages of hand welding and automatic welding in fabrication of mild steel, manganese steel and hard-facing alloys.



Use Conventional Welding Machines

Primarily a wire-feed and arc-control device, the new MF machine is easily connected to any conventional A-C or D-C welding machine and operates over a current range of from 150 to 500 amps. It consists basically of a hook-up cable, a small chassis mounting an electrode wire reel, motor-driven feed rolls and a flexible 14-ft. tube through which the electrode wire feeds to a hand-held hopper.

The portable model is provided with wheels for easy movement and is pear-shaped to help in pulling it around the job. Weighing only 34 pounds, it can be hung on a wall, where convenient, by a simple bracket. A slightly larger cabinet model is also available, caster mounted, and with ample storage space for various fluxes.

Why Magnetic Flux?

The magnetic flux provides arc shielding, deoxidation, arc stabil-

"automatically regulates arc and wire feed" . . .

ization, slag coverage of molten bead and, in some instances, alloying ingredients. Possible range of flux types is wide. Using only type of electrode wire and varying flux to suit, it is possible to deposit mild steel, build-up steels martensitic steels, martensitic irons, austenitic manganese steels and other alloys. Change from one type of flux to another is rapid and no waste of flux or electrode is involved.

When an arc is struck the welding current closes a relay which connects a drive motor to the source of welding current, and the motor feeds wire to the arc. Motor voltage (and speed) depend on voltage across the arc. if the operator should pull away from work, increased arc voltage speeds up the motor to feed wire faster. If he leans toward his work, decreased arc voltage slows down motor to feed wire slower. This holds arc gap steady at any length set by operator's control rheostat.

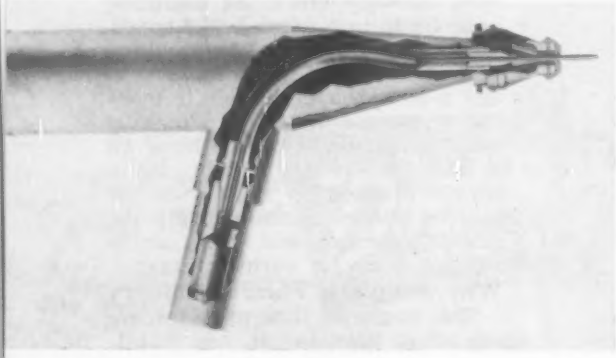
Push-Button Wire Feed

A push-button allows the operator to feed wire without striking an arc. When set up for welding, several inches of bare wire project from the hopper nozzle. A pinch of flux can be placed where the weld will begin to make starting easier and to compensate for small length of bare wire sticking out of the nozzle. Instantly after starting, wire feeding into the arc is coated with magnetic flux from the hopper.

Use of magnetic flux and a magnetic gate on hopper nozzle increases welding efficiency. Gate consists of several tiny permanent magnets in the walls of the nozzle orifice. When the machine is not welding, flux clings to these magnets in tufts and thereby blocks the annular opening around the electrode wire. When welding starts, however, the magnetic field around the electrode wire is sufficiently strong to drag the flux along with the wire as it leaves the gate.

The amount of flux (by weight) is influenced by density and granule size, both of which can be controlled, and also by the outside diameter of the magnetized flux coating. The latter depends on the size of the orifice and can easily

(Turn to Page 82)



Hand held hopper of new welder is shown in cross section. Magnetic flux clings to permanent magnets in tip of nozzle when not welding. When welding starts, bare wire feeds in automatically and strong welding current attracts a coating of magnetic flux as wire leaves nozzle.

Here's a new book YOU should have

New Revised Edition of The Pocket Manual of Arc Welding

Valuable Data — the new Pocket Manual of Arc Welding contains latest welding application data of value to foremen, supervisors, inspectors and operators—in concise, easy-to-read form.

You'll use it Every Day — in your shop work. The new Pocket Manual of Arc Welding provides practical on-the-spot information on many arc welding problems. Written from the standpoint of welding supervisors and operators, it fills a longtime need in the industry.

Order Your Copies Now— Immediately available at $1.00 each. Special discounts for larger quantities. If your welding supply distributor cannot supply you, use the coupon below.

172 Interesting Pages

Written by Lew Gilbert, editor of INDUSTRY and WELDING this "down-to-earth" Pocket Manual can be used as a welding department guide as well as a text book for operator training programs. It contains a large variety of new reference data in the form of charts, diagrams, welding symbols, efficient joint details, etc.

The Industrial Publishing Group
1240 Ontario St.
Cleveland 13, Ohio

Please send me.....copies of the (POCKET MANUAL OF ARC WELDING) at $1.00 each. Check or money-order in the amount of $..... is attached.

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Diskette

THE SUPERIOR, HIGH-SPEED PRODUCTION TOOL!

Free spindle speed of 8500 RPM means faster, more uniform work on metal, plastic or wood in regular production use or for maintenance.

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BEST OF ALL you can use your Diskette for many different jobs . . . grinding, rotary filing, hole polishing, deburring, sanding, sharpening . . . a special attachment is available for converting the Diskette to a fixed bench machine. Write today for free illustrated literature and price list.

DISKETTE SPECIFICATIONS—average free speed—8500 RPM . . . motor—Universal, AC-DC, 110V. . . . weight—approx. 5 lbs. . . . overall length—9⅝" . . . outside diameter—2¾" . . . disc capacity—4" . . . chuck—¼", collet type . . . cooling fans—double action. *Accessories available, including safety guards.*

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DEALERS: WRITE FOR OPEN TERRITORY DETAILS

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be varied. Control orifice cap is light and inexpensive and a bayonet fastening permits quick changes. A series of caps with graduated sized holes are furnished with each machine.

For further information on this new development, write the Editor, INDUSTRY and WELDING Magazine, 1240 Ontario St., Cleveland 13, Ohio, or Circle No. 120 on the Reader Service Card.

Tube Turns Reorganizes Its Sales Department

John G. Seiler, executive vice president and general sales manager of Tube Turns division of National Cylinder Gas Co., has announced the reorganization of the company's sales department. The reorganization is designed to improve marketing procedures and customer services.

John E. Chumbley, Jr. is assistant general sales manager. He administers sales policies and sales of welding fittings and flanges everywhere within the U. S., and supervises the sale of forgings. Thomas H. Pike, Jr., is merchandising manager, who now supervises merchandising activities of the Louisville general sales office, and has supervision of the Houston and Los Angeles plants and the Engineering Service Division. Jack W. Green is executive assistant who has charge of all sales policies and projects for Canada, foreign sales, conventions, shows and exhibits. Charles F. Morris is sales manager of the Forgings Division. Lincoln D. Hall is assistant sales manager and administers sales policies and sales in the Tulsa, Houston and West Coast territories.

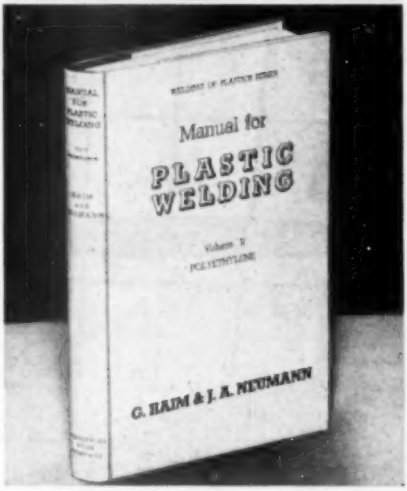
Pandjiris Announces Winners Of "Positioned Welding Essay Contest"

Winners of the first "Positioned Welding Essay Contest" were recently announced by the sponsor, Pandjiris Weldment Company of St. Louis. First prize of $500.00 was awarded to W. B. Wood, of Baltimore, for his essay entitled, "Quantity Accompanies Quality in Positioned Welds". G. Gordon Musted of Warwickshire, England was awarded second prize of $250.00. Third prize of $150.00 went to Roy W. Dryer of Wallington, New Jersey. Fourth prize of $50.00 was awarded to Robert C. Smith of Pickstown, South Dakota. And Fifth prize of $50.00 was won by A. R. Mellini of Cleveland.

The essays were judged on the basis of (1) monetary value of time saved in the experience described; (2) unique nature of the experience; (3) improved appearance of the product; and (4) cost reduction or increased production resulting from the positioning described.

Photo shows the judges for the contest. Left to right: Howard N. Simms, Black, Sivalls & Bryson, Oklahoma City; J. J. Powers, Midvale Company, Philadelphia; and E. J. Hornak, Sunbeam Corporation, Chicago.

PLASTIC WELDING



VALUABLE NEW DATA

During the last few years gas welding of plastics has been applied with particular success to a large and ever-increasing variety of constructions where it has proved invaluable. Information on this subject is rather scarce. This manual will be extremely valuable to practical welding people and to engineers who intend to incorporate plastic materials into their designs.

PRICE $6.00

Industry & Welding

1240 ONTARIO STREET
CLEVELAND 13, OHIO

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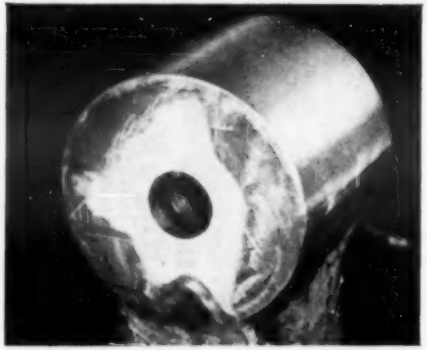
THREE DIFFERENT BREAKS in two years. Each would have normally condemned this costly equipment to the scrap heap.

This 5-ton cast-iron column of a drop-forge hammer was braze-welded with Anaconda Tobin Bronze Rod

"We've done many jobs of this type," says Wilson E. Campbell, Sr., President of Industrial Welding & Brazing, Inc., Lansing, Michigan, "but repairing this 10,000-lb. column casting for a drop hammer was as tough as any. Yet we fixed it up not once but three times



REBUILT INSIDE AND OUT with Tobin Bronze. Large punch press connection was bored for the bearing and ground off outside.

—in three *different* places—each time as good as new.

"Last year," Mr. Campbell continues, "we repaired over a thousand different parts for *one* large auto maker. We did most of this work with Tobin Bronze—our favorite welding rod for over 30 years."

Why does Industrial Welding like braze-welding for repair work? It's economical and dependable, and needs less preheating. High stresses don't build up, and there is less danger of cracking.

Why Tobin Bronze* Welding Rod? Mr. Campbell reports: "Tobin Bronze Welding Rod flows freely—'tins' fast—bonds strong and sound. It's good for a wide variety of repair welds—engine blocks, cast-iron pipe, machinery parts and other equipment."

Purity Cylinder Gases, Inc., with headquarters at Grand Rapids and branches in western Michigan and northern Indiana, supplies Industrial Welding with all their rods. Like Purity, there are Anaconda distributors throughout the United States ready to help you with your welding problems—and to serve you with the Anaconda Welding Rod best suited to your particular repair and production job. *The American Brass Company, Waterbury 20, Conn. In Canada: Anaconda American Brass Ltd., New Toronto, Ont.*

*Reg. U. S. Pat. Off. 54139

ANACONDA®
WELDING RODS

Anaconda Copper-372 • Tobin Bronze-481 • Anaconda-997 (Low Fuming) Bronze • Nickel Silver-828 • Cupro Nickel-826 • Everdur-1010 • Ambraloy-928 • Phosphor Bronze-351 • Phosphor Bronze-354

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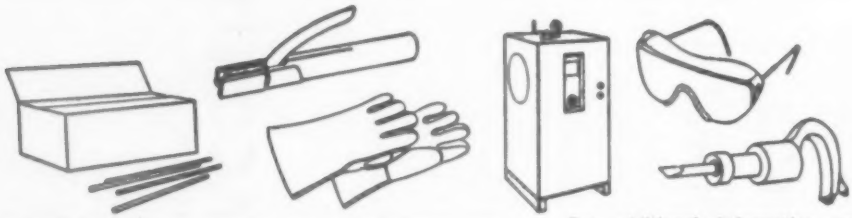
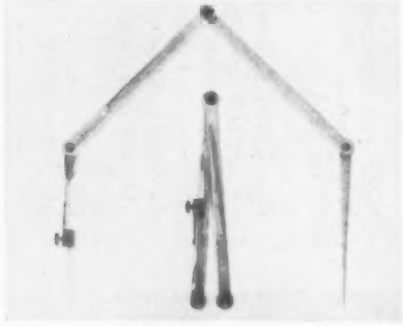


new products

For additional information on the products appearing on this and the following pages, mark the key number of the item on the card bound into this issue. Drop the card in the mail—no postage is required.

Folding Radius Marker

A new folding radius marker with a span of 24" is now manufactured by the Contour Marker Corp. Made of rust proof aluminum Dural, the new marker is designed to fold into a neat pocket sized unit measuring only 9¼" and



weighing only 8 ounces. Joints in the folding arms are equipped with special spring washers to maintain accuracy and rigidity for years of service. Pencil holder is made to hold round or flat pencils, soapstone or steel point.

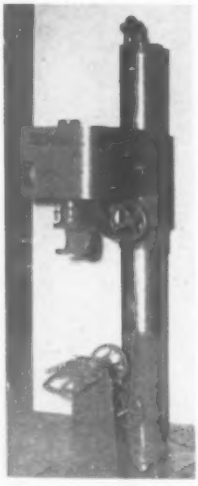
Circle No. 101 on Reader Service Card.

Contact-Type Electrode

A contact-type electrode for high-speed production welding of mild and low-alloy steels is now available. Introduced by Marquette Manufacturing Co., Inc., the electrode has a powdered iron coating and is said to weld with high tensile strength and excellent ductility. Called Marq-Rod 12, this new electrode is self-starting and restarting. It is self-welding and self-cleaning with practically no spatter, according to the manufacturer. Electrode is available in 5/32" diameter as well as regular sizes up through ¼".

Circle No. 102 on Reader Service Card.

Gas Cylinder Valving Machine



A valving machine designed to remove or insert standard gas cylinder valves from gas cylinders has been introduced by Independent Engineering Co., Inc. Unit accommodates valves with ½", ¾", and 1" cylinder connections. and gas cylinders having diameters from 3⅛" to 9¼" and lengths from 13" to 55".

Motor and wrench assembly are counterbalanced and adjustments for cylinder height can be made with a handwheel. A second control adjusts vise stand for various cylinder diameters. Cylinder gripping chain is also adjustable for cylinder diameters.

Circle No. 103 on Reader Service Card.

for high speed welding of hard-to-weld steels

Speedex-LH

the new MUREX® low hydrogen-contact electrode

Speedex–LH combines all the advantages of a low hydrogen electrode with those of a high speed contact electrode. It yields deposits extremely low in hydrogen content. At the same time, its heavy coating, containing powdered iron, provides deposition rates up to 60% faster than those obtained with regular low hydrogen electrodes.

Speedex–LH can speed your welding–save you time and money on many types of work, including:

1. *Welding of hardenable steels without preheat and without danger of underbead cracking.*
2. *Welding high sulphur steels without porosity.*
3. *Welding of cold rolled steels which tend to produce pin-holing when welded with conventional electrodes.*
4. *Welding low alloy or mild steels without cracking where stress relieving normally would be employed, but is not feasible.*

Ask to have Speedex–LH demonstrated. Contact your welding distributor or nearest M&T representative.

METAL & THERMIT CORPORATION

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MUREX electrodes · arc welders · accessories

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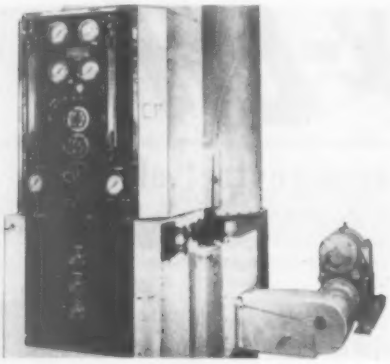
Pure Oxygen or Nitrogen

Modernized low cost, double rectification oxygen-nitrogen column, equipped with a pump for pumping bone dry purity oxygen or nitrogen has been introduced by Superior Air Products Co.



Their ease of installation and operation, combined with low maintenance and rugged construction are the result of over a quarter of a century of experience.

Circle No. 104 on Reader Service Card.

Low-Maintenance AC Welder

A complete new industrial line of low maintenance, high speed a-c welders is available from Air Reduction Sales Co. The new welders are NEMA rated 300, 400, and 500 amperes. They feature stepless current control, silicone insulation, aluminum coil windings and are equipped with a large current scale, which the operator can read from a considerable distance. Fingertip current adjustment and quieter operation are made possible by a new feature in which the coil supports float in a special rubber bushing. Called Bumblebee welders, units have a wide range of current: 38-375 on 300 amp., 52-500 on 400 amp., and 65-625 on 500 amp.

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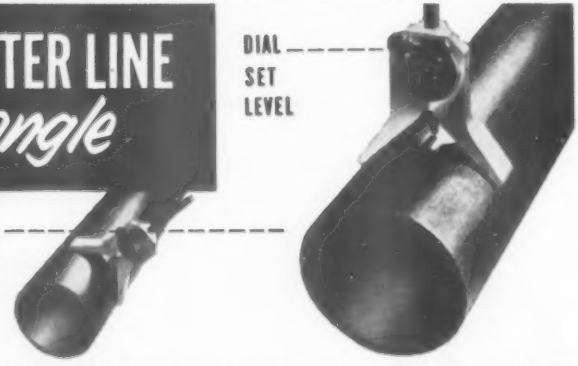
CIRCLE NUMBERS ON THE CARD AND MAIL!

MARK A CENTER LINE *at any angle*



MEASURE DECLIVITY

CHECK ANGLE BENDS

ESTABLISH BUTT-IN ANGLES

TO ESTABLISH AND MARK a point at any degree of angle on shaft, pipe or tube without numerous calculations or "cut and try" methods use the Boyce Centering Head. It's a must for welders, machinists, pipe fitters and boilermakers because it is *absolutely accurate* and saves time. Small enough to fit in your pocket, it weighs only 9 ounces. Order yours today or write for information.

CONTOUR MARKER CORP., 1843½ E. Compton Bl., Compton, Calif.

Boyce **CENTERING HEAD**

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Portable Flame Cutting Unit

Burdett Oxygen Company has introduced a new portable cutting machine which weighs only 16 pounds, making it easy to handle. The unit will cut straight

lines, circles, shapes and bevel with equal ease on metal ranging from ⅛-inch to 4-inches thick. Power is by means of 110 volt, 60 cycle motor. Unit is said to be easy to maintain and simple to operate.

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Fiber-Glass Safety Hats

This new line of fiber-glass safety hats introduced by Jackson Products meets general industrial requirements and Federal specifications for electric resistance, impact and penetration by fall-

ing objects, flammability and moisture absorption.

The full-rimmed hat, 14 oz., and the cap (with visor only, 12¼ oz.) are made in grey, white, yellow and brown. Combination safety cap and arc welding helmet is offered with either fixed or lift-front lens holder.

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THIS IS BASIC

The bitterness of poor quality lingers long after the sweetness of low price is forgotten.

It is to your best interest never to forget that there is no Santa Claus in the RESISTANCE WELDING ELECTRODE business.

Whenever price is CUT, quality is CUT! The reasons given you for price cutting are those the price cutter wants you to hear. That is the time to beware, because substitutions can be made in tip manufacture that cut cost and quality, yet are not apparent in the finished product until it is used.

No one can do business long without a *profit*. When a tip price is CUT, something is taken out. That something is QUALITY . . . and its loss will be in proportion to the price cut. If you buy cut-price tips, expect to get cut-quality tips. It is basic that you never get more than you *pay* for.

You EXPECT more from TIPALOY and you GET more! TIPALOY electrodes cost more, but for a slightly higher initial cost these are your major gains:

1. **30% to 100% longer electrode life!**
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CHECK THESE FEATURES:

- ★ Eliminates need for carrying whips.
- ★ Holder plugs in quickly and easily to any cable merely by attaching holder handle to cable end.
- ★ Less money tied up in cables.
- ★ No electrician and no tools required to change holders.
- ★ Complete holder body and jaws insulated with tough, heat-resistant fibre glass.
- ★ High pressure positive lock—perfect conductivity.
- ★ Offset jaws permit infinite variety of electrode positions without rod-bending.
- ★ Offset holder keeps welder's hands farther from arc.
- ★ Offset holder permits burning rods to shorter stubs. Result—substantial savings.
- ★ Choice of offset or straight jaws.

Send TODAY for Bulletin No. 121

cam-lok
DIVISION OF EMPIRE PRODUCTS, INC.
P. O. Box N-98, Cincinnati 36, O.

Circle No. 52 on Reader Service Card.

Hard Surfacing Electrode

A new hard surfacing electrode, HS-1 Hard-Surfacing, introduced by All-State Welding Alloys Co., Inc., is said to become twice as hard and consequently twice as wear-resistant when the equipment on which it is applied is put to work. Deposits from this electrode work harden to 48-50 Rockwell C.

An alloy of chromium, manganese and nickel and applicable with AC or DC welders, the electrode is particularly designed for both abrasion and impact wear resistance on manganese steels and high carbon steels. Electrode is available in 1/8, 5/32 and 3/16-inch core sizes.

Circle No. 108 on Reader Service Card.

Recording Hook-On Volt Ammeter

A new portable recording instrument for obtaining a permanent record of AC current voltages has been developed

by the General Electric Co's. Meter and Instrument Dept. New volt-ammeter, G-E Type CF-7, can be useful for checking loads of distribution lines, verifying motor loads, and in detecting overload circuits, transformers, motors and other AC apparatus.

Circle No. 109 on Reader Service Card.

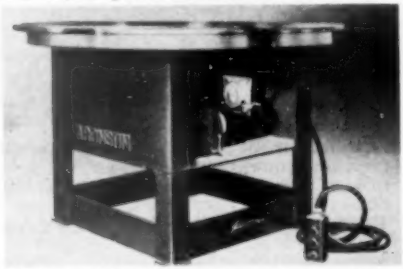
All-Purpose Mild Steel Electrode

A new all-purpose electrode for welding mild steel has been announced by National Cylinder Gas Co. The Sureweld "CE" is said to be easy to handle in all positions over a wide current range. The electrode gives a high rate of deposit with little spatter, resulting in uniform appearing beads and fine, even ripples, flat to slightly convex in profile, according to the manufacturer. "CE" is classed as an E6010 electrode and is available in seven sizes from 1/8 to 5/32-inch diameter in 12, 14 and 18-inch lengths.

Circle No. 110 on Reader Service Card.

Four Floor-Turntables

Four new floor turntable models with capacities of 2,000, 12,000, 40,000, and 75,000 pounds at 12" center of gravity location, are available from Aronson Machine Co. Each of the models can be supplied with various sizes of tables to facilitate attachment of jigs and fixtures. The speed range for the 2,000 pound and the 12,000 pound model is zero to 1.7

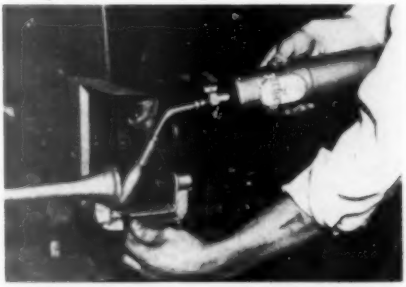


RPM, and for the 40,000 and 75,000 models from zero to 1 RPM. Constant speed is also available on all models. Magnetic braking on table rotation is standard equipment on all models to prevent overcoating of the turntable in either direction. The unit has a three button control station that is on 110 volt safety control circuit, and is supplied with 15 feet of control cable.

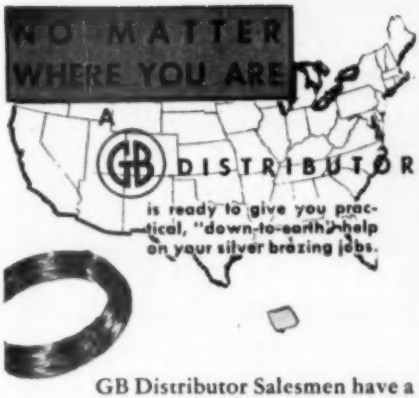
Circle No. 111 on Reader Service Card.

Propane Heating Torch

Compact and safe, this torch for use in soldering and heating applications is instant-lighting and produces an adjustable flame up to 2300°F. Eliminating hose lines and bulky containers, this torch, made by Otto Bernz Co., Inc., can be operated in any position and in confined working areas. A self-sealing device in the top of the cylinder prevents gas leakage and permits the use of interchangeable burner tips. When empty, the cylinder is discarded and a new one inserted.



Circle No. 112 on Reader Service Card.



GB Distributor Salesmen have a broad background of practical experience, as well as technical know-how in silver brazing applications. One of these men is in your area. He'll supply working samples of GB alloys and fluxes and help with your brazing problems.

Each GB standard Silver Brazing Alloy is developed for specific cost and production requirements. They are all available in the illustrated easy-to-use forms.

Call your GB distributor for all the facts. (If you don't know his location, simply write for his address.)

GB FLUXES . . . available in three main types to cover the low temperature silver brazing range:
GB No. 99—working range up to 1350° F
GB No. 88—working range up to 1650° F
GB No. 27—working range up to 2000° F

GB FLUXES . . .
Dissolve metallic oxides readily
Provide uniform flow of silver brazing alloy
Insure high joint strength

GOLDSMITH BROS. SMELTING AND REFINING CO.
1304 W. 59th Street, Chicago 36, Illinois
Suppliers of Precious Metals to Industry Since 1867

Circle No. 53 on Reader Service Card.

BRAND NEW
VERTICAL-HORIZONTAL BASE
DE-STA-CO
TOGGLE CLAMP
SPECIALLY DESIGNED FOR
WELDING APPLICATIONS

with low silhouette
the fixture-hugger that makes it far easier to insert and remove work . . .

and complete clearance
of working area due to flop-over holding bar—ideal for positioning metal or plastic sheets!

Send For
FREE CATALOG
on the new DE-STA-CO
Models 507 and 509

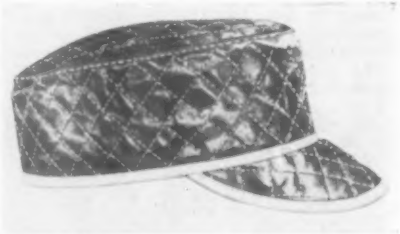
DE-STA-CO DETROIT STAMPING COMPANY
World's FIRST Line of TOGGLE CLAMPS

*324 Midland Avenue • Detroit 3, Michigan

Circle No. 54 on Reader Service Card.

Flame Retardant Caps

The danger of stray sparks igniting welding operator's cap is reduced by a new flame retardant fabric used in weld-



ing caps made by Louisville Cap Co. Caps are quilted with red, extra strength thread and have a red binding at the edge.

Circle No. 113 on Reader Service Card.

Concentrate Sanitizes Goggles and Respirators

Chicago Eye Shield Co. has announced a new concentrate which mixes instantly with water to form an effective disinfectant for sanitizing all types of safety glasses, goggles, and respirators which are not harmed by water. The disinfectant is said to be non-irritating to the skin and non-toxic in normal use. After sanitizing in a solution of CESCO concentrate, articles need not be rinsed, washed off, or wiped dry. Available in 6-oz. metered bottles, one bottle of the highly potent concentrate will produce 24 gallons of disinfectant, according to the manufacturer.

Circle No. 114 on Reader Service Card.

Light Weight Beveling Machines

A 40 percent weight reduction on their larger cutting and beveling ma-

chines has been announced by H & M Pipe Beveling Machine Co. This reduc-

tion is said to be achieved by special metal manufacturing process which makes possible complete light-metal fabrication. Now in mass production, the lightweight H & M machines now show these weight comparisons: Number Three machine, for 14 to 20-inch pipe, formerly 89½ lbs., now 53 lbs.; Number Four machine, for 22 to 26-inch pipe, formerly 123 lbs., now 66 lbs.; Number Five machine, for 28 to 36-inch pipe, formerly 155 lbs., now 95 lbs.

Circle No. 115 on Reader Service Card.

Versatile Hard-Facing Alloy

A new chrome-cobalt-tungsten hard-facing alloy for general hard-facing applications has been announced by Wall Colmonoy Corp. Called Walloy No. 6, the new alloy is available as hard-facing rod for oxy-acetylene torch application. Walloy No. 6 is said to provide high impact, corrosion and abrasion resistance on wearing surfaces. It resists oxidation, does not readily heat-check under pressure at elevated temperatures, and is virtually unaffected by most common corrosive chemicals. The alloy is available in $\frac{3}{16}$, $\frac{1}{4}$, $\frac{5}{16}$ and $\frac{3}{8}$-in. diameter rods, packed in 10-lb. containers.

Circle No. 116 on Reader Service Card.

Edgewound Silver Brazing Washers

Silver brazing costs can be reduced as much as 60% when new L-M edge-wound washers are used, according to their manufacturer, Lucas-Milhaupt Engineering Co. The washers are produced

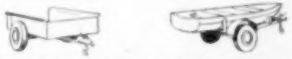
without die charges or tooling costs and eliminate scrap waste common to blanking. When used, each washer is snapped from the coil and preplaced on work as needed. Unused washers remain in coil form. This unique method of winding flat wire from standard wire stocks eliminates the usual lead time for dies and lead time for exact size strip required for blanked washers.

Circle No. 117 on Reader Service Card.

PUT MORE PROFIT IN YOUR POCKET with Hammer Blow Trailer Parts!

Work *quickly done* is profit in your pocket—and that's the best reason for using Hammer Blow *Safety Engineered* parts, on any trailer building or repair job. Now you can install precision parts *quickly* and *easily* on any conventional rig—from light utility trailers to heavy industrial models!

TORQ-LESS AXLES eliminate rocking, increase road stability; put load on the wheels where it belongs; are precision-machined of drop-forged steel. 500 to 10,000 lb. capacities; single and tandem assemblies.



BULLDOG COUPLERS link car or tractor and trailer in solid steel. Drop-forged steel socket *can't let go;* tongue ends to fit any conventional use; capacities up to 20,000 lbs.!

BULLDOG PARKING JACKS install easily, travel well; make a fine tie-in sale, allow one man to hitch and park trailer. Also three farm models to fit any wheeled implement!

We'd like to have you see our entire line of *Safety Engineered* trailer parts—just write for our free Brochure 18-L

HAMMER BLOW TOOL COMPANY
WAUSAU, WISCONSIN • *As Old As The Trailer Industry!*

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SAVE COPPER..
keep tips well dressed with
PORTER ELECTRODE TIP DRESSERS

EXTENDED TYPE

FLUSH TYPE STRAIGHT

FLUSH TYPE TAPERED

Dress Worn Tips Without Removing Them From Welder. Floating Cutter Blade keeps all Porter Dressers centered on electrode . . . Low overall height, ¾" . . . Adaptable for use on power tools, portable drills and lathes.

Write for information on sizes and prices.

C. O. PORTER Machinery Co.
676 Front Ave., Grand Rapids, Mich.

Circle No. 56 on Reader Service Card.

Improved Stud Welding Gun

A new and versatile stud welding gun was introduced at the recent National Metal Exposition by Nelson Stud Welding Division of Gregory Industries, Inc.

The new gun will be made available with two different sizes of cable, one for welding studs with diameters up to 1.2-inch and the other for any diameters from 10-gauge up to one-inch and greater. The gun will be able to weld studs up to 1½-inch studs when suitable control equipment becomes available.

Versatile new stud welding gun is explained to Lew Gilbert, executive editor, Industry & Welding Magazine; and Robert F. Huber, Steel Magazine, by Maurice A. Enright, who guided development of new gun.

Features of the new gun include accommodation of a greater range of stud lengths without changing adaptors or other accessories, arc length adjustment without disassembly and new coil design.

The new gun has a swept-back handle through which cables enter a steel barrel that extends through the plastic gun body of which it is an integral part.

Reduction in number of electrical connections from three to one and elimination of side cable loop have also been accomplished.

Circle No. 122 on Reader Service Card for more information.

Welded bridge is 1134 feet long and is made up of two 117 foot end spans and six intermediate 150 foot spans all built as one continuous unit.

All-Welded Construction Cuts Bridge Costs

Relocation of U. S. Highway 30 through Linn County, Iowa, required construction of a new bridge across Cedar River near Cedar Rapids. Designs for both riveted and welded girders were offered as bids. The project was awarded to the Iowa Bridge Co., DesMoines, with a bid of $532,708, which includes structural steel costing $267,411. Riveted structures were approximately $30,000 higher and used about 108,000 pounds more steel.

Photo courtesy James F. Lincoln Arc Welding Foundation.

RANGE OF DRUM SIZES FIT STANDARD CORE ASSEMBLY
INFLATES TO ANY DESIRED HARDNESS
RECESSED HUB
PUTS A CUSHION OF AIR BEHIND THE ABRASIVE
ROUNDED EDGES
THREADED OR UNTHREADED HOLE UP TO ¾" STANDARD
PLAIN OR SERRATED CONTACT DRUMS

New Aircore Grinding Wheel cuts faster . . . features interchangeable contact drums

One universal core assembly and a range of contact drum sizes — these are the ingredients for a new line of Nu-Matic Air-Inflated Grinding Wheels. To change wheel sizes you simply change the drum. It's like changing from conventional tread tires to snow tread tires on your car. Changing drums takes but a few seconds. The new Aircore models provide these features:

FASTER FINISHING
BETTER WORK
INCREASED BELT LIFE
FOLLOWS CONTOURS
LIGHT WEIGHT

COMPARE AT OUR EXPENSE — Send for 25-day free trial. Give job requirements and type and size of power tool used.

NU-MATIC GRINDERS, INC.
8224-P Carnegie Ave. Cleveland 3, Ohio

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Miller, Lincoln Awards; Adams Lecture Highlight 35th Annual A.W.S. Meeting

The award of the Samuel Wylie Memorial Medal, the presentation of the Lincoln Gold Medal and the 1954 Adams Lecture were the highlights of the 35th Annual Meeting of the American Welding Society held in conjunction with the recent National Metals Exposition and Congress.

A. F. Davis, vice president and secretary of the Lincoln Electric Co., received the Samuel Wylie Miller Memorial Medal for outstanding contributions to the advancement of the art of welding,

The Lincoln Gold Medal for best welding paper published in the Welding Journal went to Professor A. A. Toprac, University of Texas.

William L. Warner, engineering research advisor, Watertown Arsenal, delivered the Adams Lecture entitled "The Toughness of Weldability."

About the recipients . . .

A. F. "Charlie" DAVIS

A. F. "Charlie" Davis was awarded the Miller Medal for his clear vision of the value of welding knowledge and his generous contributions to the promotion of welding education.

Long active in the welding industry, Mr. Davis has been associated with Lincoln Electric Co. since 1914. He has been the guiding light behind the J. F. Lincoln Arc Welding Foundation founded in 1936 to stimulate scientific progress in arc welding.

In 1942 Mr. Davis established at Ohio State University the A. F. Davis Welding Library. In 1945 he established the A. F. Davis welding awards given yearly for outstanding papers on welding written by undergraduate students.

PROF. A. A. TOPRAC

Prof. Toprac received the Lincoln Gold Medal for the most original welding paper published in the Welding Journal during a 12 month period ending this July. His article, "An Investigation of Welded Rigid Connections for Portal Frames" was published in January, 1954.

WILLIAM L. WARNER

Mr. Warner was named the outstanding scientist or engineer who had made a new or distinctive development in the field of welding. In his Adams Lecture he covered the significance of toughness on the serviceability of welds and described his methods for evaluating this property.

HUMBERSTONE HEADS A.W.S. FOR 1954-55

Newly elected officers of the American Welding Society took office at the 35th Annual Meeting of the A.W.S. in Chicago, Illinois. These officers will serve for the 1954-1955 year.

Elected President was Joseph H. Humberstone, president of Air Reduction Sales Co. Long active in Welding Society affairs and well known in the industry, Mr. Humberstone will direct the activities of the more than 9800 members.

First Vice President will be J. J. Chyle, head of welding research for A. O. Smith Corp. and known for his work in development of welding electrodes.

JOSEPH H. HUMBERSTONE
President

Clarence P. Sander, general superintendent, Vernon Plant, of Consolidated Western Steel Div. of U. S. Steel Co. in Los Angeles is newly elected to the post of Second Vice President.

J. J. CHYLE

C. P. SANDER

News about Directors-at-Large and new District Directors can be found on next page.

35th Annual Meeting — American Welding Society

Newly elected Directors-at-Large are E. D. Peters, Leader Iron Works, Decatur, Ill.; R. J. Yarrow, Consolidated Iron & Steel Mfg. Co., Cleveland; G. O. Hoglund, Aluminum Co., of America, New Kensington, Pa.; and J. L. Wilson, naval architect and engineer, New Jersey.

E. D. PETERS

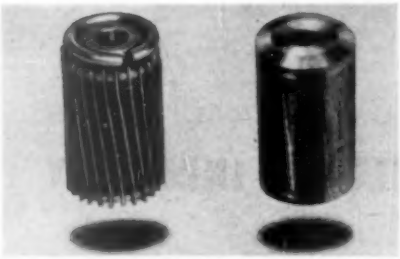
J. L. WILSON

G. O. HOGLUND

R. J. YARROW

THE FOLLOWING DISTRICT DIRECTORS WERE ELECTED . . .

Southwest District—J. B. Davis, Director of the Tulsa Testing Laboratory, Tulsa, Okla.; Central District—J. R. Stitt, Research and Welding Engineer, R. C. Mahon Co., Detroit, Mich.; New England District—H. H. Stahl, Stahl Equipment Co., Brookline, Mass.; Midwest District—H. Jackson, Plant Superintendent, Thompson Pipe & Steel Co., Denver, Colo.; Western District—R. H. Smith, Partner, Smith and Klemmer Co., Phoenix, Ariz.



Use Induction Brazing On Midget Rotors

In one of the more complex brazing operations on record, Servomechanics, Inc., induction braze midget rotors with pre-placed brazing rings. The rotor rotates at 400 rpm at temperatures ranging from —150°F to over 200°F.

Brazed joints must have high conductivity and no flux can be used in joining. Joints must also be free of any tendencies toward corrosion or crystallization and must have exceptionally high strength.

Photo courtesy United Wire & Supply Corp.

American Locomotive Appoints McClung

Appointment of E. R. McClung as assistant manager of the Alco Products plant of the American Locomotive Company at Dunkirk, N. Y., has been announced by E. F. Murphy, manager. Prior to this appointment, Mr. McClung was assistant manager of Alco's ordinance plant in Schenectady. He is a member of the American Welding Society, having served as chairman of the Philadelphia section in 1947 and 1948.

Seasons Greetings

More than 350 Eutectic District Engineers join in wishing you and yours a Merry Christmas. In sincere appreciation of the friendship of weldors around the world, we resolve to help you enjoy a successful and prosperous New Year. Eutectic Welding Alloys Corporation.

The Industrial Publishing Group
1240 Ontario St.
Cleveland 13, Ohio

Please send me.....copies of the (POCKET MANUAL OF ARC WELDING) at $1.00 each. Check or money-order in the amount of $..... is attached.

Name .....

Address .....

City and State .....

NEWS of the WELDING INDUSTRY

Williams & Company To Hold A Welding Clinic In Toledo

Williams & Company is holding a welding clinic in Toledo on Wednesday, Thursday and Friday, January 19, 20, and 21. On Wednesday and Thursday the hours will be from 1:00 P.M. to 9:00 P.M. On Friday the hours of the show will be from 1:00 P.M. to 6:00 P.M.

The company is building a new warehouse in Toledo which they expect to have completed this fall. The clinic will be similar to the ones which the company held in Cleveland and Pittsburgh in 1952 and 1953. Williams expects to have very good attendance.

Merit Appoints Sales Reps

Appointment of three new sales representatives for Sand-O-Flex contour sanders and Grind-O-Flex flexible grinding wheels has been announced by Ray Hermanson, vice president in charge of sales, Merit Products, Inc., Culver City, California.

Norman Dahley, 329 South Wood St., Chicago, will cover Illinois and Wisconsin. The Herren Sims Co., 1601 St. Clair Ave., Cleveland will cover Ohio and West Virginia. New York State will be handled by W. J. Holtmeier Co., 71 West 23rd St., New York City.

Lutes Appointed Head Of McKay's Hard Surfacing Department

William L. Lutes has been appointed manager of the Hard Surfacing Department of the Electrode Division of The McKay Company, according to Fred A. Kaufman, General Manager. Mr. Lutes will be in charge of development and application research of hard surfacing electrodes in the York, Pa. plant.

D-V Welding Controls Bought By Engineered Instruments, Inc.

Engineered Instruments, Inc. is taking over the facilities and operations of D-V Welding Controls of Oakland, California, according to David R. Callow, president of Engineered Instruments, Inc. The D-V Welding Controls Co. produces specialized controls for the automatic starting and stopping of motor-driven d-c arc welding equipment. George C. Lydiksen, well known in the welding equipment field, will head sales of the D-V Control Division.

Rely on ARCALOY

STAINLESS STEEL ELECTRODES for Perfect Welds—Every Time...

Arcaloy stainless steel electrodes are reliable. You can count on the closely controlled quality supervision under which they are produced to give you top-flight, uniformly excellent welding, month after month.

Arcaloy stainless steel electrodes are available for all grades of chrome-nickel and straight chrome stainless steels with either AC-DC coating or lime coating. Your Alloy Rods distributor is ready to supply the right electrodes for your corrosion and heat resisting services . . . get in touch with him today.

- ▶ *Uniform* welding characteristics.
- ▶ *Stable, smooth arc* with *fine spray* weld metal transfer.
- ▶ Slag easily and completely removed—*cuts cleaning, grinding and polishing time.*
- ▶ *Controlled* high quality.
- ▶ *Properly* formulated coatings.
- ▶ *Perfect, sound welds in all positions.*
- ▶ *Analyses* for all A.I.S.I. stainless steel grades.
- ▶ *Packaged* in hermetically sealed metal containers.

Alloy Rods Co.

General Offices and Plant • York 1, Pa.
Pacific Coast Sales Offices and Plant
El Segundo, Calif.

ARCALOY Stainless Steel Electrodes
BRONZE-ARC Bronze Electrodes
NICKEL-ARC Electrodes for Cast Iron
TOOL-ARC Electrodes for Tools and Dies
WEAR-ARC Hard-Facing Electrodes
WELD-ARC Low Hydrogen Electrodes
CUT-ARC Cutting Electrodes

no finer electrodes made . . . anywhere

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N.W.S.A. Appoints Convention Committee

James N. Alcock, of Saginaw Welding Supply Co., and president of the National Welding Supply Association, has announced the appointment of a special committee to complete arrangements for the association's Eleventh Annual Convention that will be held at the Edgewater Beach Hotel, in Chicago on May 18-20. The committee will be under the chairmanship of E. C. Caluwaert, O. K. I. Welding Supply Co., Cincinnati. The committee will be composed of the following association members: Les Dloughy, Superior Welding Supply Co.; H. R. McGarvey, H. R. McGarvey Co.; A. J. Fausek, Modern Engineering Co.; F. J. Hupertz, Calumet Welders Supply; N. C. Miller, Miller Electric Mfg. Co., Inc. and C. E. Dennis, Sellstrom Mfg. Co.

Look . . .
it SWIVELS!

We mean the tips on those new Smith's Welding Torches. They swivel to any angle you want while flame stays burning! You don't need to shut off gas or stop your work: Just turn the tip to a new angle and away you go!

Drop us a card — we'll tell you more.

SMITH WELDING EQUIPMENT CORPORATION

Dept. IW-102 2633 S. E. 4th St. Minneapolis, Minn.

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Welders' Clamps

Each tool is INDIVIDUALLY POWER-TESTED

Solid bronze alloy screws, forged steel heat treated frames. Ground cable connection. Built for industrial use. Ask your Distributor for the Hargrave catalog of Clamps, Punches, Chisels, and Masonry Drills.

THE CINCINNATI TOOL CO.
1985 Waverly Avenue, Cincinnati 12, Ohio
• There is an Industrial Distributor stock near you.

HARGRAVE
The Complete Line of Tested
TOOLS

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Sawyer To Birmingham For KSM

Richard H. Sawyer, formerly with Hays Supply Company, Memphis (Tenn.) distributor for KSM Products, Inc., has been assigned to Birmingham, Alabama, to open a new KSM engineering sales district. A mechanical engineering graduate of the University of Tennessee, Sawyer is well qualified, through training and experience to assist stud-welding users.

Harnischfeger Corporation Opens New District Office

A new district office has been opened in Cleveland by the Welding Division of the Harnischfeger Corporation. The new office is under the managership of Mr. A. T. Mortrud and will handle sales of all P&H welders, electrodes, positioners, and accessories.

Circle No. 62 on Reader Service Card.

Crobalite
cobalt-chromium-tungsten
HARD-FACING ALLOYS

Easy to apply
by arc or torch. Flow on extra-readily in a uniform, slag-free layer.

Give Superior Resistance
to abrasion, corrosion, oxidation and impact—with high hardness—even at red heat.

Three Proven Grades
meet every requirement of production and maintenance, in every field.

FREE CROBALITE BULLETIN gives details. Write for it — today!

DISTRIBUTORS: We invite your inquiries.

Crobalt, Inc.
2800 S. State St., Ann Arbor 2, Mich.

AMERICA'S BIGGEST ARC-WELDER VALUES

Model 125A
110/220
125 Amps.
$98.50
Complete
Accessories
F.O.B. Factory

TRINDL, the preferred welder by those who know welding at its best. Designed and manufactured by specialists. Advanced engineering assures continuous production service eliminating work stoppage. No moving parts to wear—low operating cost—8 INDUSTRIAL MODELS range from 80 to 400 amps. Ruggedly built to meet the demands of industry.

Model 400A 220/440 400 amps. continuous, $370.00 complete.

Trindl
FOR TESTED ARC WELDERS

TRINDL PRODUCTS, LTD.
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Chicago 16, Illinois

Write for latest descriptive illustrated literature.
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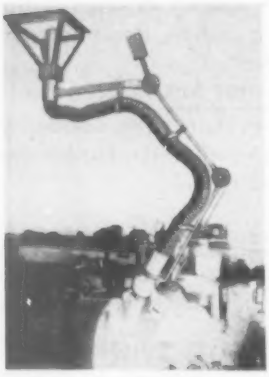
Engwald

Welding Fume Exhausters

"World's Finest Exhaust Systems"

MANY EXCLUSIVE FEATURES



W-200 SERIES

- Portable and stationary units for all applications.
- Unlimited flexibility, fast, easy positioning, over 360° radius.

Can be connected in series, mounted at remote points or attached to units.

Intake Hood Quickly Removes Smoke and Fumes.

Available in 9, 12, or 16 feet reach units.

Write For New Application Data . . .

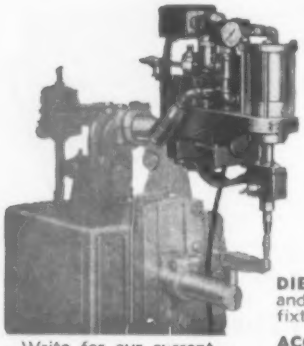
Engwald Corporation
357 LAFAYETTE AVE.
BROOKLYN, N. Y.

NEW HOBART DISTRIBUTOR

Ed Mors and Vern Miller have announced the opening of Hobart-North Welding Supply, Inc., at 4815 W. Diversey Ave., Chicago. The firm will distribute Hobart arc welding machines, electrodes and accessories in the Chicago area.

Burke Named New Cylinder Sales Representative For Norris-Thermador

William B. Burke has been appointed western cylinder sales representative of Norris-Thermador Corporation, according to Rodney Mastick, manager of cylinder



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Solve Your Welding Problems **at HOFFMAN-CHICAGO**

Spot, Butt, Seam, Gun, Flash, Projection, Multi-Point and Stud Welders

NEW • USED • REBUILT

← **WELD-AIR-MATIC**
Spot welder air conversion unit. Tests prove 10,000 welds hourly on continuous daily schedules.

BUTT-ON-SPOT →
Automatic butt welding attachment. Water - cooled, fits any spot welder with minimum horn clearance of 7".

DIES: complete facilities to design and build special welding dies and fixtures for your piece parts.

ACCESSORIES: complete stock of Welder Controls, Holders, Tips, and Bar Stock.

ROBT. W. HOFFMAN CO., INC. 38 South Clinton Street, Chicago 6, Illinois

Circle No. 65 on Reader Service Card.

sales for the company. Mr. Burke has recently received his MBA degree from Stanford University Graduate School of Business. At present Mr. Burke is participating in the Norris-Thermador comprehensive sales training program.

Ampco Metal Appoints Three Weldrod Distributors

The Weldrod Department of Ampco Metal, Inc. has announced the appointment of three new franchised distributors. The Hart Industrial Supply Co., of Oklahoma City, will cover the sales area adjacent to that city. Arcway Equipment Co. of Richmond, Va. will service the Richmond sales area. The Industrial Supply Co., of Hazleton, Pa., will be the exclusive distributor in the Wilkes-Barre and Hazleton sales area.

These companies will carry a full line of Ampco Bronze Weldrod products and also bare filler rods and coiled wire for automatic and semi-automatic welding processes.

COLUMBIA TONG TEST
AC-DC AMMETER

Yes — there's an easy, quick way to measure actual welding current. Simply clamp the Tong Test Ammeter around the electrode cable. Instantly you get an accurate ampere reading, without breaking the circuit.

Tong Test is the only clamp-type instrument that can be used on both AC and DC. It is safe, convenient and light in weight.

Assure good welding quality by controlling your amperage. Tong Test is low in cost and will be a profitable investment in preventing costly defects and rejects. Four types with interchangeable ranges to 1000 amperes.

Write for Tong Test Bulletin IW-400

COLUMBIA ELECTRIC MFG. CO.
4545 Hamilton Ave., Cleveland 14, Ohio

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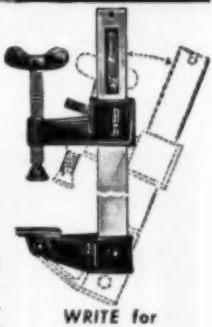
Bar Clamps with *hinged foot* swing to and from work



Mount on any flat surface . . . bench, saw horse, etc., to make instant acting clamping jigs or fixtures. Ideal for repeat operations. Clamps are fixed, always available when needed—but swing out of way when not in use. Also usable as regular bar clamp.

WRITE for "Jorgensen" Hinged Clamp details and catalog.

ADJUSTABLE CLAMP CO.

mfrs. of SHIELDED welders clamps • "C" clamps • bar clamps

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Circle No. 68 on Reader Service Card.

Cut downtime and end costly production losses with Ampco Weld wheels.

Ampco Weld hardness and toughness at elevated temperatures provide unusual wear resistance. Many users report up to 150% longer life with Ampco Weld seam-welding wheels.

All wheels meet or exceed RWMA specifications. Ampco Metal, Inc. gladly furnishes engineering service for specialized applications. Order Ampco Weld wheels now — and get tough with costs.

*Reg. U. S. Pat. Off., Ampco Metal, Inc.

RW-8A

AMPCO METAL, INC.

MILWAUKEE 46, WISCONSIN

West Coast Plant: Burbank, California

It's production-wise to Ampco-ize!

Goldsmith Bros. Displays Six Foot Masonite Circle

Goldsmith Bros. Smelting & Refining Co. designed and constructed this six foot Masonite circle, which was exhibited at the National

Chemical Exposition and the National Metal Exposition. In addition to exhibiting genuine samples of some of the more common precious metal products, such as silver brazing alloys, silver cyanide, silver nitrate and jewelers' gold alloys, it afforded the public an opportunity to see some of the rarer elements and their compounds.

SEE PAGE 24 FOR VALUABLE FREE LITERATURE AVAILABLE

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STRONGER WELDS

Use Only Those Good
SAFE NON-TOXIC
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No. 1 Cast Iron Welding Flux.
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No. 4 "Braz-Cast" Flux for Bronze Welding Cast Iron.
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No. 9 Stainless Steel Welding Flux.
No. 11 Tinning Compound.
No. 15 Welding Flux for Magnesium Alloys.
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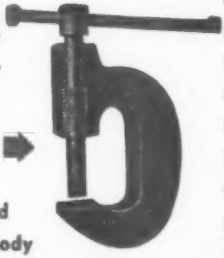
No Threads to Damage

DESIGNED for WELDING

- Threads never exposed
- Solid plate body



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Knight Joins Haynes Stellite

D. E. Knight has joined the staff of the General Sales Department of Haynes Stellite Co., a division of Union Carbide and Carbon Corp., in Kokomo, Indiana. Mr. Knight will work with the development of hardfacing materials. He was formerly Service Engineer with Unionmelt Dept., Linde Air Products Co.

Ansteth Wins Lincoln Foundation Award

William Ansteth, employed by the Thomas Landscape and Nursery Company of Tulsa, Oklahoma, won the $1,000 First Award in competition sponsored by The James F. Lincoln Arc Welding Foundation. The award was one of 191 made to persons in non-industrial business and service establishments who submitted papers describing how welding is or could be used in the operation or maintenance of their business or service.

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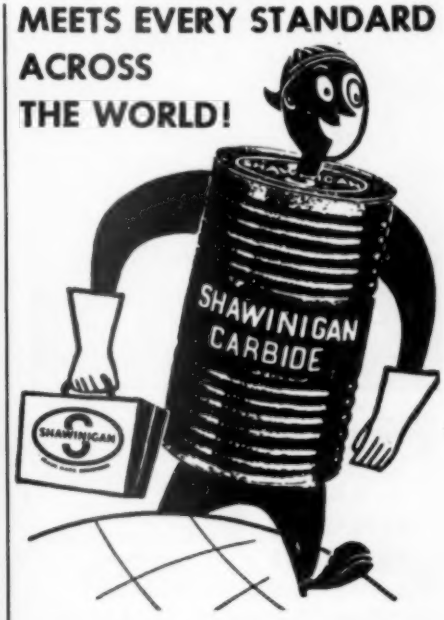

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Rudel Retires As President Of American Machine Tool Distributors' Association

Thomas R. Rudel (left), retiring president of the American Machine Tool Distributors' Association, receives an inscribed gavel emblematic of the office he held for a year from his successor, Raymond A. Vidinghoff. At right is James C. Kelley who becomes the association's general manager. Mr. Vidinghoff was elected president at the Association's annual meeting. Vidinghoff is president of Machinery Associates, Inc. Mr. Rudel is president of Rudel Machinery Co., Inc.

See Page 32 for easy index to welding products

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Over 100 specialized job-tested EUTECTIC Low Temperature WELDING ALLOYS for gas or arc applications minimize dangers of stress—strain—distortion—brittleness . . . permit vast new savings through product design simplification. Over 350 trained District Engineers, coast to coast, offer FREE Consultation-Demonstration to help solve YOUR metal-joining problems. No cost . . . no obligations. Write TODAY.

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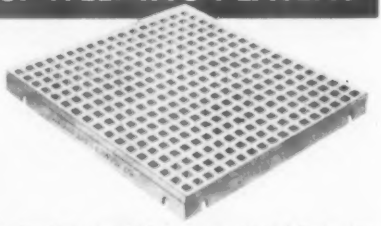

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All-State Appoints New Regional Manager

Glen C. Flumerfelt has been appointed a Regional Manager for All-State Welding Alloys Co., Inc. Mr. Flumerfelt will cover the states of California, Nevada, Utah, Colorado, New Mexico and Arizona and the Hawaiian Islands. He will be responsible for sales and service to the users and distributors of All-State alloys and fluxes in his area.

New Building for NCG

A major step in National Cylinder Gas Co. service to Northern California was made recently when the company moved into its new building at 1588 Doolittle Drive in San Leandro, according to H. E. Rhoades, district manager. The building is located on a 7½ acre site and is the first unit in a projected plant expansion program for the Northern California area.

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For **all** your needs . . . Marquette offers the newest, most **complete** line in the industry today:

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AND NOW
Heavy Duty Industrial AC Welders—6 Models
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Welding electrodes for all applications
Oxy-Acetylene Welding and Cutting apparatus
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PERMANENT CLEANABLE

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Eliminate Dust to Maintain • Cooler Motors • Constant Arc • Longer Brush and Rotor Life • Greater Welder Efficiency • Constant Welder Operation • No Shut-downs • No blowing out of welders

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Here's the Flux for those really TOUGH jobs in your shop. JOHNSON'S NEW ALL-PURPOSE BRAZING FLUX cleans metal all around . . . does an amazing job of dissolving oxides of burned and dirty metals . . . yet DOESN'T BURN OUT! JOHNSON'S NEW ALL-PURPOSE BRAZING FLUX does a faster job at lower cost.

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Alloy Rods Appoints Five New Distributors

E. R. Walsh, III, general sales manager of Alloy Rods Company has announced the appointment of the following new Alloy Rods Company distributors: District Oxygen Company, Inc., Brentwood, Maryland; Dow Supply Co., Grand Fords, North Dakota; Edmac, Inc., of Winston-Salem, North Carolina; J. B. Thomas Co., of Nashville, Tennessee, and Welding Equipment Co. of Oklahoma City, Oklahoma.

Bonney Appoints Texas Representative

Robert Bader has been appointed sales engineer at Houston, Texas for the Welding Fittings Division of the Bonney Forge & Tool Works, Allentown, Pa. Prior to his assignment to Houston, Mr. Bader served with Bonney's Eastern sales division.

K-G Appoints Two New Distributors

Atlantic Acetylene Company of Morrisville, Penna., has been appointed distributor of the K-G line of welding and cutting apparatus, accessories and supplies in eastern Pennsylvania and western New Jersey.

Handling the K-G line in the Philadelphia area will be Peacock Welding Company, 404 North 6th St., Philadelphia.

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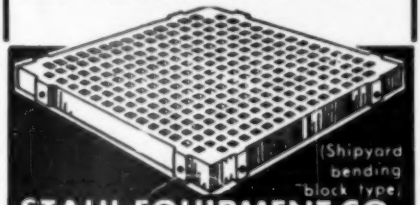

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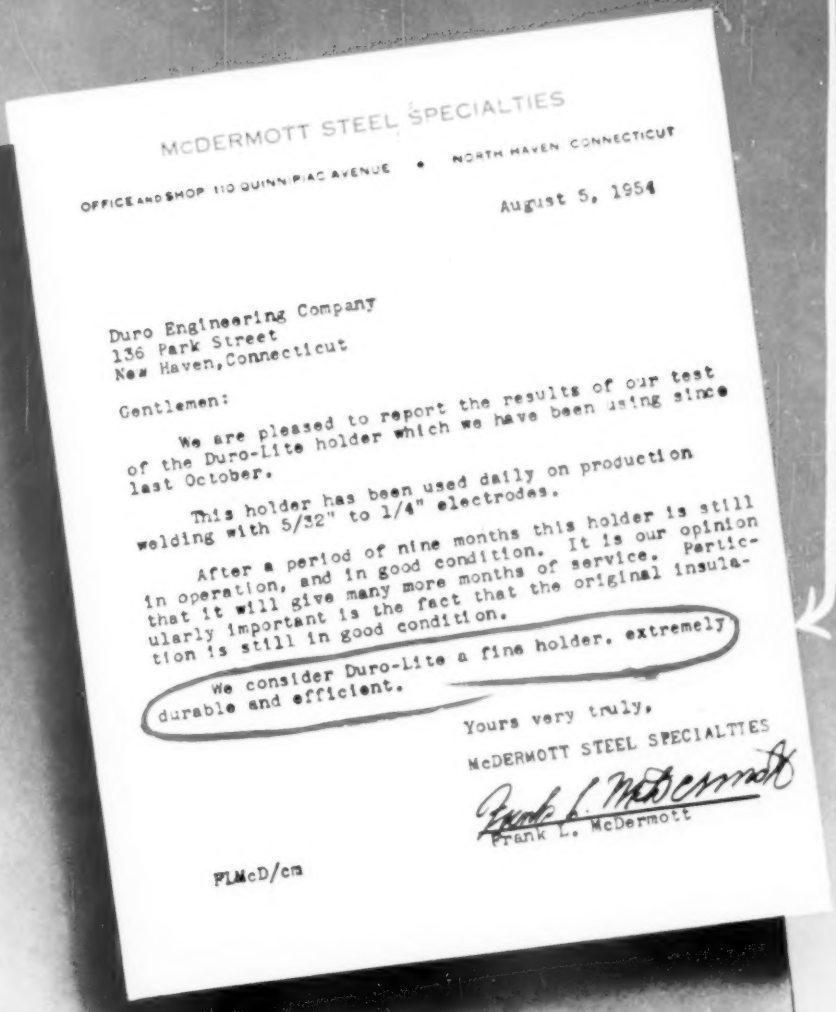

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August 5, 1954

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Gentlemen:

We are pleased to report the results of our test of the Duro-Lite holder which we have been using since last October.

This holder has been used daily on production welding with 5/32" to 1/4" electrodes.

After a period of nine months this holder is still in operation, and in good condition. It is our opinion that it will give many more months of service. Particularly important is the fact that the original insulation is still in good condition.

We consider Duro-Lite a fine holder, extremely durable and efficient.

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